SCIENTIFIC AMERICAN

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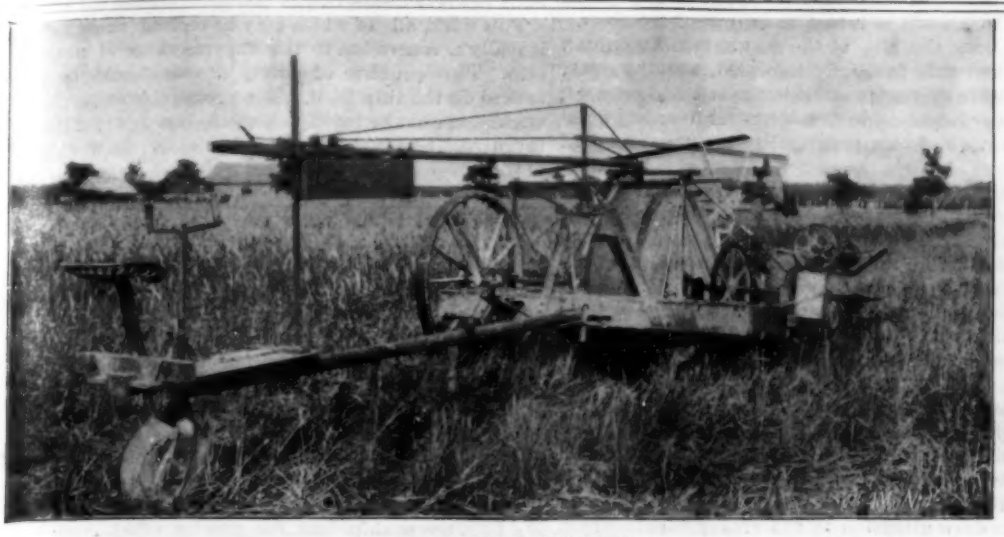
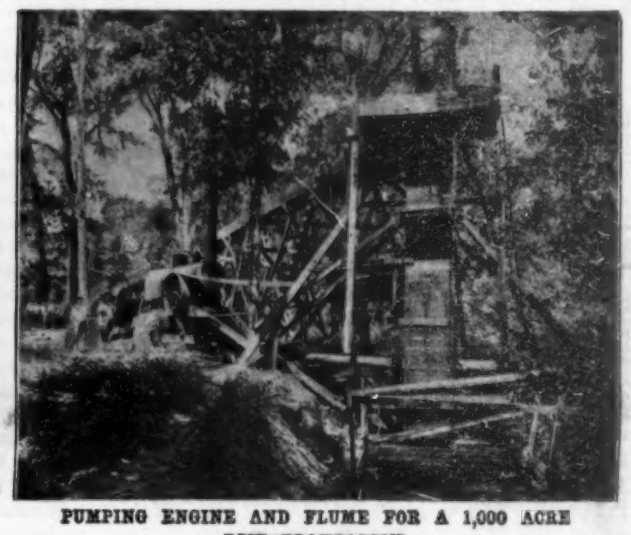


A RICE CUTTING MACHINE.



PUMPING ENGINE AND FLUME FOR A 1,000 ACRE RICE PLANTATION.

RICE CULTURE IN SOUTHWESTERN LOUISIANA.

BY H. H. CHILDERS.

At present rice is a leading industry in only two States of the Union, though at one time it was grown in many States. Louisiana and South Carolina are now the rice-producing States, and in these States its production continues to be profitable. Within the last few years some impetus has been given this industry in Southeastern Texas, but so far it amounts to little more than an experiment. At one time rice was planted in the States of North and South Carolina, Alabama, Georgia, Florida, Mississippi, Louisiana, Texas, Virginia, Tennessee, Missouri, Kentucky, Arkansas, Michigan, Minnesota and California, and for some reason, perhaps by the law of the survival of the fittest, the acreage decreased until the quantity produced in all except the two States mentioned was no longer appreciable. This falling off may have been caused by destructive competition with foreign countries and by the discovery that the soil chosen for rice production in those States above mentioned was found to be inadequate and unsuited for lucrative results.

Rice is grown in Louisiana in the lower Mississippi, La Fourche and Terre Bonne River valleys and in the southwestern portion of the State, in the parishes of Calcasieu and Acadia. Rice growing for commerce began in Southwestern Louisiana in the year 1884. Before that time the largest field that could be found was five acres in size. But that year a colony of Iowa farmers settled in Calcasieu Parish, and each year since that time the acreage has continued to increase in that belt of prairie country, taking in Acadia and St. Landry Parishes.

The older authorities on rice growing have claimed that this cereal must be grown in alluvial soil, but this statement is successfully contradicted by the facts, and other wet soils have been found that have in them the elements that enter into the body of the rice grain. The soil in Southwestern Louisiana is clay loam, with clay subsoil. It is thoroughly saturated with moisture, and the underlying subsoil acts as an impervious basin, preventing anything like a perfect absorption, or the disappearance of the water from the surface. Unlike the prairies of Western Texas, all during the winter, and not unfrequently during the summer seasons, the water stands ankle deep even in places covered by the "feather top" or "broom sage" grass; and the pedestrian who would

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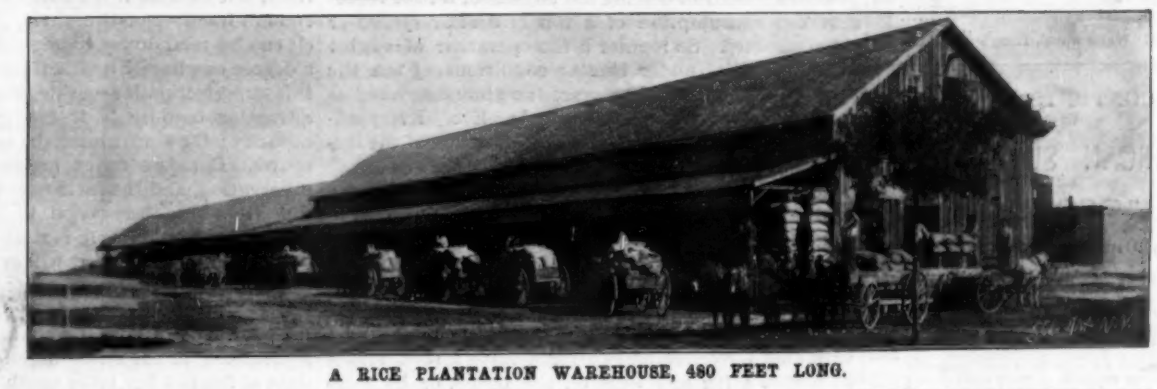
HARVESTING RICE ON A LOUISIANA PLANTATION.



A RICE PLANTATION WAREHOUSE, 480 FEET LONG.

CYCLONE THRASHER AT WORK ON RICE PLANTATION.

Scientific American.

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OUR FIFTIETH ANNIVERSARY PRIZE ESSAY COMPETITION.

Though it is doubtless well known to the majority of our readers that the SCIENTIFIC AMERICAN ranks as one of the oldest journals in the United States, they may not be aware that it has now been making its appearance, week by week, without interruption for a period of half a century.

We feel that it is due at once to our readers and to ourselves to make some special commemoration of so interesting an event as the fiftieth anniversary of the formation of the present firm, and we have decided that this shall take the form of a profusely illustrated special number, which will be issued on July 25 of this year.

It has been the aim of the SCIENTIFIC AMERICAN to keep the public faithfully informed, week by week, of the world's current progress in the arts and sciences; and it is our intention to devote the anniversary number to a review of this progress during the past half century.

One of the most interesting features of the issue will be the publication of a prize essay on the subject of "The Progress of Invention during the Past Fifty Years," for which we are offering a premium of two hundred and fifty dollars.

The conditions governing this competition will be found on another page, from which it will be seen that all manuscript should be received at this office on or before June 20, 1896. The papers will be passed on by a select jury of three, whose names will be announced in a later issue. We are desirous that all the essays submitted should receive careful attention, and to this end we request that intending competitors will forward their manuscript at their earliest convenience.

We also draw attention to the arrangements which we have made to secure a vote upon the question as to what invention introduced within the past fifty years has conferred the greatest benefit upon mankind. The result in any case will be of special interest, and particularly so if, as we hope, the majority of all of our large body of readers and subscribers will express their opinion.

MODERN STEAMSHIPS AND NAVIGATION.

The modern steamship is a favorite subject for exemplifying modern progress. In early days man dreaded the ocean, and the cruise of Ulysses along the shores of the Mediterranean and Æneas' voyage with its constant landings are records of the old time coasting navigation. Little by little man forced his way upon the more open seas, until at the present time the ocean is crossed with almost the regularity of a ferry, and probably with greater relative regularity. The five hundred foot hull is driven remorselessly through seas at a speed that would have swamped the ship of fifty years ago. The twenty to thirty thousand horse power expended in driving the engines of a liner represent the consumption of a ton of coal every two or three minutes. So regular is the operation of engine and boilers that under similar conditions of sea the screws act as a log and measure the ground covered as accurately as the regular log and log line. Every adjunct available for increasing the efficiency of the service is employed.

In all its appliances arranged to be operated on the unstable platform supplied by a steamship in a gale of wind, the seagoing steamship embodies some of the greatest triumphs of modern engineering and science. Yet in spite of this the unavoidable weaknesses and imperfections of the service go to prove how well founded was man's dread of the sea. Ship after ship collides with another vessel, sinks after striking a rock, misses its port in a fog and runs on the beach, or by pure luck avoides a similar catastrophe and tries hard to attain the tribute of silence for its narrow escape. The mere fact that the shores of our coast are patrolled by members of the life saving service, part of whose duty is to burn a warning light if a vessel is seen dangerously near the shore, proves the crudity of our most advanced methods of navigation. The fact that the captain of the St. Paul, which went ashore on the beach at Long Branch, was exonerated from all blame shows that man has not yet achieved his mastery over the sea with its concomitants of fogs, gales and ocean currents. Recent strandings and collisions in the harbor of New York go to prove the same thing.

The ingenuity of the inventor has done much to ameliorate these conditions. Gas buoys float upon the waves, and, charged with compressed gas, give a brilliant light for three months or more without any attendance. Along dangerous channels or near shoals electric buoys are established supplied with current from the shore, so that light is turned on at sunset from the shore station miles distant. Wave action is utilized most ingeniously in the whistling buoy and bell buoy to give audible warnings to navigators.

The modern lightship is no longer an almost helpless hulk, whose only safety is in her anchors. She is a well built ship, with steam or power signaling plant, and perhaps with steam propelling engine to bring her to port if her cables give away. Along the coasts the most elaborate system of patroling and of life saving stations finds development, the bicycle even having recently been adopted in the patroling of hard beaches. The almost romantic history of the inventor Francis and his metallic lifeboat and the accounts of the many rockets and mortars devised for carrying lines to wrecked ships go to show what the inventor has done to save life and property from wrecked ships.

In lighthouses proper, the advance from the old reflecting light with candles as illuminants to the modern lantern with Fresnel lenses, with a four-wick oil lantern, Wigham gas burner, or electric arc light, giving an illuminating power of hundreds of thousands of candle power, tells what science and invention have done to avert disasters.

This work, all of which may be termed shore work, is really a concession to the imperfections of navigation. The problem of safety at sea should be attacked on the ship itself. The unsinkable ship, whose engines cannot be totally disabled, has not yet been invented. She is approximated to only. In the best of the ocean steamers the unavoidable imperfections bear eloquent testimony to man's inability to cope with the sea.

The first thing that impresses a novice who takes the tiller in a boat for the first time is the extreme difficulty of keeping a moving vessel upon a fixed course. He finds that unceasing attention and constant changes of the rudder are required. The tiller cannot be held in one position for more than a few seconds at a time. On the modern liner the same thing holds. The power the helmsman can exert by the steam steering gear is instant in effect and ample in amount, but is not sufficient in either factor to enable him to hold the ship upon a constant course. As the ship rolls and lists, one or the other propeller, if she is a twin screw ship, has the greater effect, and her head constantly tends to go to starboard or to port, and the tendency has to be counteracted by the helm. Every wave parted by the bow exerts some degree of deflecting power, also to be met by the helm. Looking at a six or eight inch compass card, these deflections may seem of little account, but when referred to a radius measured by a day's or hour's run, or even by the ship's length, they appear in their true magnitude.

A single degree of deflection on a radius of five hundred feet, taken as the ship's length, represents a deviation of nearly eight feet from the course. An error of one degree for an hour's run would give a deviation of nearly 2,000 feet, and for the day of over four miles. But a degree on the compass card is very little. A point, the regular unit of the compass card, is eleven and a quarter degrees, and many a ship yaws from side to side over an arc of two points, giving a length deviation of eighty or ninety feet. In all accurate work the surveyor or geodesist uses the compass as little as possible; not only on account of its variations, but because it is impossible to read it to a small enough fraction of the circle. With a vernier a circle can be read down to seconds; with the compass a degree can barely be fractioned. The compass with this imperfection is accurate enough for the steamship navigator because it is too good for his steering capacity; the ship cannot be held down to a compass course. Compass errors are constantly corrected by observation, and the instrument is only used in running from one observation to another. But perfect navigation would imply perfect dead reckoning. It is doubtful if man's powers will ever mount to the height of perfectly controlling a ship at sea, or even of enabling her to live up to her compasses.

The futility of dead reckoning received a startling illustration in the stranding of the St. Paul. A few days of fog put her miles south of her proper position and far ahead of her reckoning. Groping along with constant soundings she ran ashore upon a beach of reasonable regularity of pitch, and narrowly escaped serious damage or total wreck.

The most prominent improvement in modern steamships develops a new imperfection. Twin screws are now almost universal in the more modern types of first-class ships. In the old single screw system trouble was experienced from the screw lifting out of water as the ship pitched. Every approach of a screw to the surface weakens its propelling power. This is so well recognized that in many small vessels the screws are carried below the line of the keel to give them "solid water" to work in. In the twin screw ship the lifting trouble is intensified. Not only does pitching raise her screws toward the surface, but rolling and listing do the same. The screws carried well to the sides approach alternately the surface as the ship rolls in a moderate sea, so that standing by the taffrail the blades can be seen showing their tips out of water. The pitching trouble is diminished by the increased length of modern ships, but the rolling of the screws out of water takes its place.

The rolling interferes with the direction of motion of the ship, as it changes the relative propelling power of the two screws. The ship is pushed first to one side and then to the other, the total of the propelling force is reduced and the constant shiftings of the rudder also go to impair her speed. If she takes a list and holds it she may need a port or starboard helm to be

maintained for a considerable time, the deflected rudder operating to destroy speed. In overcoming the trouble described there would seem to be a field for ingenuity and invention. The modern steamship and modern navigation are as yet far from perfect. Dead reckoning fails to give position because the direction of course is uncertain, and speed cannot be accurately maintained or determined. All the troubles co-operate to produce uncertain results, and really scientifically accurate work at sea is still far from realization.

There are problems of the most difficult kind to be dealt with in controlling the ship and in supplying means for ascertaining her work once she is so controlled.

The National Academy of Sciences.*

The stated or spring meeting of this, the most distinguished of American scientific associations, was held in Washington for four days, beginning on April 21. It was the first session held in Washington since the election of Prof. Wolcott Gibbs to the presidency of the academy, and the meeting was looked forward to with much interest. In accordance with a rule established at the meeting held in Philadelphia last autumn, the business and other private affairs of the academy were discussed in secret session, beginning at ten o'clock in the morning, after which the members adjourned to luncheon, which was served in the United States National Museum, and the afternoon was then given up to the public reading of papers with their discussion. This practice was found to work excellently, and the friends of the members, or those interested, who desired to listen to the papers, accordingly knew when to come, and were not, as was the case previously, compelled to be in attendance all day waiting for the adjournment of the business sessions of the academy.

The attendance of members was unusually large, and among those present were: Cleveland Abbe, Washington; Carl Barus, Providence, R. I.; John S. Billings, New York; Lewis Boss, Albany, N. Y.; Henry P. Bowditch, Boston, Mass.; William H. Brewer, New Haven, Conn.; William K. Brooks, Baltimore, Md.; Edward D. Cope, Philadelphia; Samuel F. Emmons, Washington; Wolcott Gibbs, Newport, R. I.; Theodore N. Gill, Washington; G. Brown Goode, Washington; Benjamin A. Gould, Cambridge, Mass.; Arnold Hague, Washington; Asaph Hall, Washington; Charles S. Hastings, New Haven, Conn.; George W. Hill, West Nyack, N. Y.; O. C. Marsh, New Haven, Conn.; Alfred M. Mayer, Hoboken, N. J.; Thomas C. Mendenhall, Worcester, Mass.; Edward S. Morse, Salem, Mass.; John W. Powell, Washington; Ira Remsen, Baltimore, Md.; William A. Rogers, Waterville, Me.; Ogden N. Rood, New York City; Henry A. Rowland, Baltimore, Md.; Charles S. Sargent, Cambridge, Mass.; Charles A. Schott, Washington; Samuel H. Scudder, Cambridge, Mass.; William Sellers, Philadelphia, Pa.; A. E. Verrill, New Haven, Conn.; Francis A. Walker, Boston, Mass.; Charles A. White, Washington; and Arthur W. Wright, New Haven, Conn.

The following programme gives a full list of the papers presented before the academy:

The Geological Efficacy of Alkali Carbonate Solutions, by Eugene W. Hilgard; On the Color Relations of Atoms, Ions, and Molecules, by M. Carey Lea; On the Characters of the Otocœlidæ, by Edward D. Cope; Exhibition of a Linkage whose Motion Shows the Laws of Refraction of Light; Location in Paris of the Dwelling of Malus, in which he made the Discovery of the Polarization of Light by Reflection; and (1) On Experiments showing that the X Rays cannot be Polarlarized by passing through Herapathite, (2) The Density of Herapathite, (3) Formulæ of Transmission of the X Rays through Glass, Tourmaline, and Herapathite, by Alfred M. Mayer; Biographical Memoir of James Edward Oliver, by George W. Hill; Biographical Memoir of Charles Henry Davis, by Charles H. Davis; Biographical Memoir of George Engelmann, by Charles A. White; Legislation Relating to Standards, by Thomas C. Mendenhall; On the Determination of the Coefficient of Expansion of Jessop's Steel, between the limits of 0° and 64° C., by the Interferential Method, by Edward W. Morley and William A. Rogers; On the Separate Measurement, by the Interferential Method, of the Heating Effect of Pure Radiations and of an Envelope of Heated Air, by William A. Rogers; On the Logic of Quantity, by Charles S. Peirce; Judgment in Sensation and Perception, by John W. Powell; The Variability in Fermenting Power of the Colon Bacillus under Different Conditions, by A. W. Peckham (presented by J. S. Billings); Experiments on the Reflection of the Roentgen Rays, by Ogden N. Rood; Notes on Roentgen Rays, by H. A. Rowland; Some Studies in Chemical Equilibrium, The Decomposition of Diazo-compounds by Alcohol, and On Double Halides containing Organic Bases, by Ira Remsen; Results of Researches of Forty Binary Stars, by T. J. J. See: On a Remarkable New Family of Deep Sea Cephalopoda and its Bearing on Molluscan Morphology, The Question of the Molluscan Archetype, an Archi-mollusk, and On some Points in the Morphology and Phylogeny of the Gastropoda, by Addison E. Verrill; Source of X Rays, by Albert A. Michelson and S. W. Stratton; The Relative Permeability of Magnesium and Aluminum to the Roentgen Rays, by Arthur W. Wright; The State of Carbo-dioxide at the Critical Temperature, The Motion of a Submerged Thread of Mercury, and On a Method of Obtaining Variable Capillary Apertures of Specified Diameter, by Carl Barus; On a New Type of Telescope Free from Secondary Color, by Charles S. Hastings; The Olindiadæ and other Medusæ, by William K. Brooks; Budding in Perophora, by William K. Brooks and George Lefevre; and Anatomy of Yoldie, by William K. Brooks and Gilman Drew.

As is shown by the list of papers, those on physical sciences predominated, and the Roentgen rays was a popular topic. Notwithstanding papers on this subject by Michelson, Rood, Rowland, and Wright, it was evident that as yet no theory as to their origin was tenable. Experiments by one authority seemed to indicate conclusively that his opinion was correct, whereas a second authority pointed out a new series of experiments that clearly indicated another point of view. No accepted conclusions were possible, and it was agreed that the question of their origin was a complex one.

The naturalists were represented by Cope, Verrill, and Brooks, each of whom presented papers before the academy, principally technical.

The members chosen to the council were Benjamin A. Gould, Henry P. Bowditch, George J. Brush, Ira Remsen, Othniel C. Marsh, and Simon Newcomb. These gentlemen, together with the officers who are ex-officio members, constitute the governing body. The academy appointed Ira Remsen, of Johns Hopkins, John Trowbridge, of Harvard, and George J. Brush, of Yale, as delegates to the sesquicentennial celebration of Princeton University, which will be held in Princeton on October 22 of this year.

The third day's session was made conspicuous by the announcement of the names of those who had been chosen members of the academy. Although it is possible to elect five persons at the Washington meeting, such an event seldom occurs, and this year but two names were accepted. The first was Charles Doolittle Walcott, director of the United States Geological Survey, who is perhaps the first authority on the Cambrian in the United States, and who has worked his way from the ranks of the survey to its highest place, succeeding Maj. John W. Powell in the directorship in June, 1894. The second academician chosen was Robert Simpson Woodward, now professor of mechanics in Columbia University, New York City. Prof. Woodward was for some years connected with the United States Naval Observatory in Washington, and then passed to the service of the United States Coast Survey, whence he was called to Columbia. Both of the gentlemen elected are well known in scientific circles and are members of the American Association for the Advancement of Science.

*Report of meeting prepared for SCIENTIFIC AMERICAN by Marcus Benjamin, Ph.D.

Cycling Notes.

The charities of Paris receive $3,000 as their share of the recent cycle meeting.

In France, bicycles are taxed at the rate of about $2.25 each per year; the tax yields about $400,000 per annum.

"Pedaleurs" and "pedaleuses" are the terms which the Parisians now employ to designate cyclists of the two sexes.

During the year 1895 there were exported from England cycles and cycle parts of the value of $6,959,050.

Cycles are used in large numbers in Johannesburg, South Africa. It is said there are 4,000 in use by all classes in that place.

A paper published in Paris devoted to builders invites architects to discuss the accommodation of bicycles in private houses.

Strange to say, the wheel now forms no inconsiderable portion of the miscellaneous supplies forwarded to the missionaries abroad.

An Englishman named Jefferson has started on a 6,000 mile bicycle ride to Irkutsk, in Siberia. His machine and baggage weigh sixty pounds.

The Naples authorities have just imposed a tax upon wheels used for pleasure or sport. This tax is ten francs. If the machines are used partly for business purposes, they are only taxed five francs.

A few of the New York postmen have tried the experiment of using wheels in making their rounds, but the roads have proved so poor that it is feared they will have to abandon the use of the wheel.

The only cycles which are exempt from taxation in France are the wheels in the hands of dealers which have not been sold and those owned by various government officers for the use of their messengers.

It would really seem as though the horse was discredited even in the far West, for a short time ago Little Black Bear, a Nez Percé Indian chief of Oregon, traded thirty head of horses for a bicycle.

Though Moscow has nearly five thousand wheelmen, only about one-half have permission to ride in the city limits. Russia asks $12.50 duty on each wheel imported into that country, no matter what the price may be.

Queen Margarita, of Italy, while riding in a part of the park at Monza from which the public is excluded, was stopped by a guard who scolded her for trespassing, and asked her name. She sent the man her photograph and a ten franc piece bearing her effigy with that of King Humbert's.

The experiment which has been tried in New York of mounting policemen on wheels has turned out in a very satisfactory manner. The bicycle police have rendered most efficient service in the pursuit of wheelmen who violate city ordinances, and in the catching of runaways and criminals.

Many wheelmen do not pay sufficient attention to the lubrication of the chain. It is really remarkable how much easier a wheel will run which has its chain cleaned for every twenty-five or fifty miles ridden. Both the stick graphite and the paste graphite may be used together with advantage.

The following is given as a receipt for a fine lamp oil: Fill a pint bottle with two-thirds of the best lard oil and one-third of headlight oil, to which add a piece of gum camphor about the size of an egg. The camphor is supposed to cause the oil to give a very white light, and it is said that the lamp will not go out easily.

Cycling is not a very dangerous recreation after all, as is proved by statistics. In England only 30 deaths were produced by cycling in twelve months. On comparing this number with the total number of the fatal highway and street accidents through England and Wales, it will be found that barely two per cent of them were caused by cycling.

What can be done in case of emergency was demonstrated a short time ago by a wheelman who had his tire badly punctured on the way home from Coney Island. He detached his injured tire, and, securing a heavy piece of rope, substituted the rope for the tire and made the journey home, some eight miles, in safety. The club of which he was a member has had the rope framed.

It is an ordinary sight in London to see bicycles chained to the railing outside of the fashionable and exclusive clubs along Pall Mall and Piccadilly. The house committees of the various clubs having declined to allow a wheel to be taken inside the clubhouses, some of the clubs have rented small places near by where liveried attendants look after and clean the wheels of members.

A curious story is told of a French cyclist who wheeled up to a gendarme and asked him for his sword, saying that a mad dog was running ahead and he wanted to kill it. The officer gave the wheelman his sword and the latter disappeared. He presently returned and handed back the sword dripping with blood. He had overtaken the infuriated animal and dispatched him without dismounting from the wheel.

The San Francisco News Letter brings forward an interesting point. It wonders if any enterprising boy will ever open stands where bicycles can be cleaned while you wait. After a long trip a rider would gladly pay a small sum to any boy who would do the job properly. Berlin has opened establishments for cycle cleaning. For a small annual subscription the wheel is called for, cleaned as often as desired and returned. In many of our riding academies cleaning is now a feature of the business.

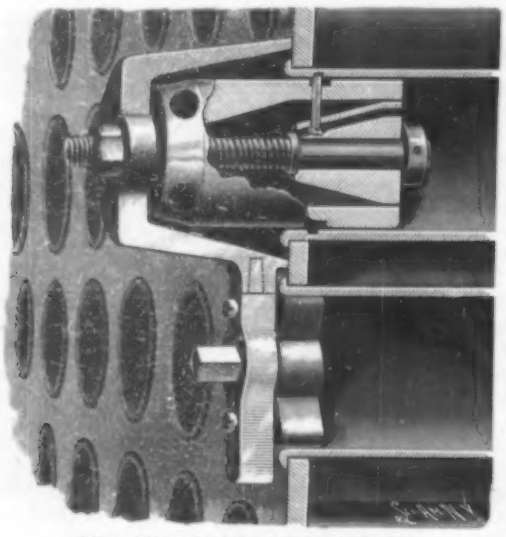
In London the way of the transgressing cyclist is hard. A member of the nobility, who lost control of his machine going down a steep hill, was fined for furious riding. A German baron was fined for riding on the wrong side of the street. Mr. Arthur Balfour came to grief while riding on his bicycle in Whitechapel. He got jammed in a crowd of vehicles and had to take the pieces of his bicycle to Downing Street in a hansom cab. He has had two other accidents within a short time.

A wooden bicycle path is to be erected in Kalamazoo, Mich. It will be constructed of heavy plank; the grain of the lumber will run with the course of the track, the boards being sawed through the center upon a circle corresponding with the course of the track. The piece will then be reversed, the straight sides being placed together, thus forming a section of the track. The end joints will alternate and all uneveness will be planed down. In this manner the track will offer as little resistance as possible, says the American Wheelman.

In driving out a refractory crank key or other part of similar dimensions, where there is danger of "burring" the edges or destroying the thread, if only a hammer or wrench is employed, it is a good plan to use a copper penny to protect the part. In case of a crank key to be removed, for instance, put a piece of shingle, or almost any kind of wooden chip, on the under side of the crank boss, against the key, and hold the copper penny on top of the key or cotter pin. You may strike the penny with absolute freedom from fear of injuring the pin, and drive it out, no matter how tight.

AN EFFICIENT BOILER TUBE CUTTER.

To quickly and conveniently cut off a tube in the boiler, for removal and the substitution of a new one, the appliance shown in the illustration has been devised and patented by Julius Richard, of Bisbee, Arizona Territory. The cutter slides in a tool carrier in which is a feed screw holding loosely a feed block which is longitudinally movable, and is formed with an incline to feed the cutter outwardly in contact with the tube. A yoke resting on the front face of the boiler sheet surrounds the outer end of the flue to be



RICHARD'S BOILER TUBE CUTTER.

cut, and the feed screw is turned in the yoke by means of a nut on the outer end of the screw, whose inner end is smooth, and carries the feed block loosely between a fixed and a removable collar. The feed block has a lengthwise dovetailed groove in which slides the base of the cutter, whose shank extends through an opening in the wall of the tool carrier, the latter rotating with its front end on the feed screw, and being turned by a rod or bar to move the cutter around within the flue to be cut. The yoke is cut out on one side to permit the insertion of the bar in one of the apertures of the carrier, whereby the latter may be turned in a step by step manner, the cutting edge of the cutter then cutting the inner side of the flue, and the cutter being from time to time forced outward by the turning of the nut on the outer end of the feed screw. To lock the yoke in working position, a threaded boss in its base at one side is engaged by a screw connecting it with a plate extending in front of the flue below, and in this plate turns a short shaft with a square offset on its outer end and cam-actuated jaws on its inner end, the turning of the shaft by a wrench or other tool moving the jaws outward into firm contact with the inner surface of the adjoining flue, and thus firmly supporting the yoke in front of the flue to be cut off.

THE INGLETON STEAM PLOW.

The accompanying illustration shows Mr. Ingleton's newest design of steam plows, which is being manufactured by the Ingleton Manufacturing Company, whose office is at 308 Walnut Street, Philadelphia.

As will be seen by referring to the engraving, the machine differs widely from all other steam plows, inasmuch as the travel of the plows is in a direction at right angles to the travel of the engine. The advantages of such an arrangement may be said to be as follows:

The resistance of the plows being across the line of travel of the engine, there is no tendency to hold back or impede the forward motion of the latter. The gearing of the engine is thereby relieved from all strain, and the driving wheels, having nothing more to do than merely carry the weight of the engine, do not slip, nor sink into the land, as they do when a heavy load is attached directly behind the engine. As a matter of fact, the plows have what is known as a lead, which gives them a tendency to draw toward the land, and this drawing toward the unplowed land, coupled with the power required to turn over or push the six furrows back from the apparatus, has the tendency to force or propel the machine ahead, precisely the same as a steamship is propelled by her screw. It has been found, according to Mr. Ingleton, that the apparatus attached to the back end of the traction engine not only requires no hauling, but when in full work has to be held back by the engine.

Another advantage of these plows is the low speed of the apparatus, which is from one-half to three-quarters of a mile per hour across the field, while a swath from thirty to fifty feet wide is cut. This rate of speed gives the engine—whose crankshaft is making 200 revolutions per minute—an enormous power over its work. Added to this is the important advantage of the engine having to run across the fields but once for every thirty or fifty feet plowed; whereas, in pulling a set of gang plows behind it, it would have to cross the field once in every seven feet, and then at a rate of at least four miles per hour, or eight times faster than in the present case.

It should be stated that although the apparatus has a forward move of half a mile per hour only, yet the plows, attached to the endless chain, travel at a rate of four miles per hour, or eight times faster than the engine is moving, so that almost the whole power of the engine is consumed in doing actual plowing. The cost of plowing an acre of land by this system has been placed at 45 cents.

The machine was exhibited at the Minnesota and Missouri State fairs, in operation, last September and October, and was awarded a special diploma by each of these associations.

A large number of these plows is being ordered for South America.

THE INGLETON STEAM PLOW.

A New Type of Telescope.

A very important discovery has been made by Prof. C. S. Hastings of the Yale Scientific School, the result of which is a new type of telescope, in which the defect known as the secondary color aberration is removed without the use of other than the ordinary silicate glasses, says the Evening Post.

In developing last summer the optical equations involving the thickness and separation of lenses to the second order of magnitudes, Prof. Hastings found a term which might be of the opposite sign to that involved in the equations of color correction. Although it seemed improbable that this would afford a means of correcting the old error, it demanded, in the professor's opinion, further investigation. After much labor he demonstrated theoretically a new method by which the secondary chromatic aberration, which had resisted solution for almost a century and a half, might be remedied. He next constructed a telescope with a ratio of focal length to diameter of only eight and a half, for use with the spectroscope. This has fulfilled in every way the hopes founded upon the theoretical investigation. It shows the solar spectrum with absolutely unvarying focus from extreme red to extreme violet, eliminating all secondary color aberration. While the experiment has not gone beyond this, there is no reason to doubt that the method is applicable to telescopes of all sizes.

Several years ago Prof. Hastings published a construction involving a lens of but two kinds of glass, which very nearly met the desired end. But it has proved impossible to obtain large pieces of glass of the required kinds, and thus the method has been confined to small telescopes. It is an interesting historical fact that Fraunhofer, while endeavoring to solve this same problem, discovered the lines of the solar spectrum which bear his name. The discovery of Prof. Hastings will add at least ten per cent to the power of the telescope, so that an instrument with a ten inch object glass will be about equal to an eleven inch telescope of the existing type.

AIR PRESSURE RELIEF VALVE FOR HOSE COUPLINGS.

The illustration represents an improvement to be applied to the coupling heads of flexible tubing or hose connecting the train pipes of adjacent cars, for lowering the air pressure sufficiently to enable the coupling

COLWELL'S AIR BRAKE HOSE COUPLING.

to be easily broken. A patent has been granted for the invention to William C. Colwell, locomotive foreman, S. S. and O. G. Division, Ocala, Fla. As represented in Fig. 1, the half coupling head is shown attached to the free end of the hose, and a portion is broken out to show the position and a section of the relief valve, screwed into a bottom opening in the coupling head, Fig. 2 being a side view of the valve. As will be seen, the valve proper seats downward and has two aligned stems, the upper one working in an inner removable head, and being surrounded by a spring which holds the valve normally closed when no air pressure is on. The other stem of the valve projects downward through a hexagonal head in which are lateral passages communicating with the chamber of the valve, there being also openings in the inner head of the casing and in its side, communicating with the valve chamber. By pressing with the thumb on the outer end of the valve stem, the tension of the spring is overcome and the valve is lifted to permit the escape of air from the coupled hose, enabling the couplings to be easily detached from each other.

The Engineer Road Carriage Competition.

As was announced last year, The Engineer, of London, has offered 1,000 guineas to the owners of horseless carriages that are successful in a competition to be held some time in 1896. The Engineer hopes that the antiquated laws which still obtain will be repealed in time to have the race this year. One hundred guineas have been added to the 1,000 already offered, this additional sum being for a naphtha or gasoline engine, as it is hoped that the laws governing the carriage of light oils will be modified by the time of the competition. The exhibition of machines will be held at the Crystal Palace, the grounds of which will also afford facilities for holding the subsidiary trials. The date and the route which will be followed in the run have not been definitely decided as yet, but the run will probably occur some time in October, and the course will not be less than 100 miles and return, or 200 miles in all. Any vehicle which does not complete the run at a minimum speed of five miles an hour, including all stoppages, will be disqualified. No speed over ten miles per hour will be taken into account. The judges which have been appointed are Sir Frederick Bramwell, F.R.S., M.I.C.E.; Mr. John A. F. Aspinwall, M.I.C.E., chief engineer to the Lancashire and Yorkshire Railway; and Dr. John Hopkinson, F.R.S., M.I.C.E.

THE late Richard A. Proctor stated that our earth receives only the one two-billionth part of the heat of the sun.

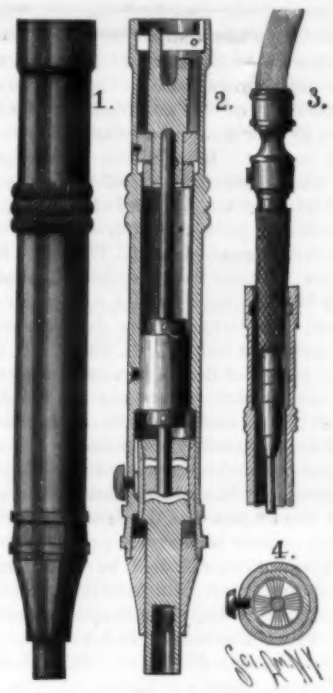
AN IMPROVED DENTAL PLUGGER.

The illustration represents a dental tool which has a double action, being able to strike a number of blows with the point at one revolution of the driving shaft, and the point being brought into action either when its working surface is pressed against an object or when the point is pulled rearwardly. By its use, also, fillings of any shape may be perfectly placed and located in any desired position. The improvement has been patented by Ormond E. Wall, Honolulu, Hawaiian Islands. Figs. 1 and 2 are side and sectional views of the tool, Fig. 3 showing a portion of the plugger barrel, with a hand piece in position in its end. In the forward end of the barrel is screwed a plug, bored to receive the loosely sliding point chuck, having at its outer end a socket for the plugger point, while within the barrel, adjacent to the plug, is a sliding cylinder, longitudinally grooved to receive a projection preventing it from revolving on the pressing of an exterior button. The point socket has at its inner end a head screwed into the outer end of this cylinder, and in the opposite end of the cylinder is a plug, the inner face of which, and of the chuck head, have ratchet or undulating surfaces, as shown in the transverse view, Fig. 4, an intermediate revolving piston also having two similar undulating surfaces. The piston is secured to the end of a drive shaft turning loosely in a guide block, the shaft being rotated in various ways, and being shown in Fig. 2 adapted to receive a slip joint. An ordinary drill hand piece may, however, be employed, as shown in Fig. 3. In operation, the plugger point is screwed to the chuck, the ratchet teeth of which are, by pressing on the point, brought in contact with the ratchet teeth on the outer face of the rotating piston, the four ratchet teeth causing four blows to be struck at each revolution of the piston. For the back action, the cylinder is moved forward by pulling on the plugger point, when the teeth of its inner ratchet engage with the inner ratchet of the rotating piston, producing a similar series of back-acting blows. By pressing on the button to prevent the revolution of the cylinder, the operator is enabled to pick up gold, carry it to the cavity and place it in position, without the plugger making any blows and without stopping the machine.

BERLIN INDUSTRIAL EXPOSITION OF 1896.

The Berlin Industrial Exposition was opened on May 1, by Emperor William. This exposition is of enormous proportions and will be a great credit to the empire. Forty buildings have been erected for the purposes of the exposition in Treptow Park in the north of Berlin. The grounds used for exhibition purposes are larger than those of the Paris Exposition of 1889. The river Spree, which is so narrow in the heart of the city, widens out at Treptow Park, really forming a small lake. This gives a chance for some fine effects of landscape gardening. The position of most of the buildings will be seen by referring to the engraving.

The main building covers a space of 53,000 square meters, and is intended to shelter the displays of most of the groups exhibiting in the exposition. Two tall



WALL'S DENTAL PLUGGER.

and slender towers and a grand aluminum cupola give this building a very striking and graceful appearance. A vast, crescent-shaped colonnade in front of this structure serves as a covered promenade ground, and contains, besides an elegant café, a number of institutions for the convenience of the visiting public, such as post and telegraph office, telephones, reading rooms and bureaus for the press, money brokers, information, etc.

The building for Chemistry, Mechanics, Optics and Photography (2) contains the exhibits of these groups, and also a lecture room for lectures on popular scientific subjects. The great Fisheries building, consisting of two adjoining wings connected by a central structure, will harbor in its walls the groups of Food Products and Beverages (3) and the Fishery and Sport Exhibition (4).

The municipality of Berlin exhibits in a separate pavilion (5) the system of technical, industrial and mechanical schools now established in the capital of Germany. The building for Water and Gas (6) shows models and plans of conduits and gas fixtures of all sorts. The Alpine Panorama (7), with an inclined plane railway, presents a drastic and imposing picture of the Zillerthal and its glaciers. Visitors will enjoy such a magnificent view from the Restaurant (8), situated on the banks of the Spree, that it will become deservedly a favorite resort. In the marine exhibition (9) large models of all sorts of shipping, men-of-war and merchantmen, will be displayed and maneuvers carried out in exact imitation of real naval exercises. The Giant Telescope referred to in our last issue (10) will prove a great attraction for scientists and the public in general. Old Berlin, with the Theater Old Berlin (11), a most artistic reconstruction of the old city, carries the visitor back centuries ago to that time when the present vast metropolis was but the capital of the Electorate of Brandenburg. The German Colonial Exhibit (12) will strive to give a faithful picture of the German Colonies, not only by exhibiting their natural products and manufactures, but also by displaying groups of the natives and by showing the mode of life they lead at home. The Grand Main Restaurant (13), situated as it is in the center of the grounds and on the choicest spot of the same, will doubtless prove a favorite resort for all visitors.

The progress made in educational matters up to date, as well as all improvements in sanitary and benevolent institutions, can be studied in the building (14) erected especially for those groups.

A most original and interesting spectacle of Oriental life will be presented to the visitor in "Cairo in Berlin" (15), a gorgeous but faithful imitation of the capital of Egypt with its streets and buildings. The Horticultural Exhibition (16) will be a beautiful and magnificent display of nature's most graceful products.

Gondolas and many pleasure boats of every style will enliven in an interesting and attractive manner the Grand Lake (17), constructed on a former popular playground, and this magnificent artificial basin of water, with the extensive avenues of fine old plantains that line its banks, will form a picture of beauty the visitors will never forget, while in strong contrast with this artificial body of water, still vying with it in beauty, is the old Carp Pond (18), with its green banks, its swans and waterfowl. It was the idyl of Treptow Park and will prove to be the idyl of the Exposition.

1. The Main Building. 2. Lecture Hall and Building for Scientific Industries. 3. Group for Food Products. 4. German National Exposition of Fisheries and Sports. 5. Pavilion of the Municipality of Berlin. 6. Pavilion for Water and Gas. 7. Alpine Panorama of the Zillerthal. 8. Grand Restaurant on the River Spree. 9. Marine Spectacle. 10. Giant Telescope. 11. Theater Old Berlin and Old Berlin. 12. German Colonial Exhibition. 13. Main Restaurant. 14. Educational and Benevolent Institutions Exhibit. 15. Cairo. 16. Horticultural Exhibition. 17. The Grand Lake. 18. The Carp Pond.

BERLIN INDUSTRIAL EXPOSITION OF 1896.

Notice.

A premium of $250 is offered by the SCIENTIFIC AMERICAN for the best essay on

THE PROGRESS OF INVENTION DURING THE PAST FIFTY YEARS.

This paper should not exceed in length 2,500 words.

The above-mentioned prize of $250 will be awarded for the best essay, and the prize paper will be published in the Special 50th Anniversary Number of the SCIENTIFIC AMERICAN of July 25. A selection of the five next best papers will be published in subsequent issues of the SCIENTIFIC AMERICAN SUPPLEMENT at our regular rates of compensation.

The papers will be submitted for adjudication to a select jury of three, to be named hereafter.

Rejected MSS. will be returned when accompanied by a stamped and addressed envelope.

Each paper should be signed by a fictitious name, and a card bearing the true name and the fictitious name of the author should accompany each paper, but in a separate sealed envelope.

All papers should be received at this office on or before June 20, 1896, addressed to

Editor of the SCIENTIFIC AMERICAN,
361 Broadway, New York.

Correspondence.

Raising the Water Level of the Great Lakes.

To the Editor of the SCIENTIFIC AMERICAN:

Observations made here during the slow opening of navigation this season have thrown considerable light on the vexed question of maintaining the levels of the Great Lakes against the constant tendency of the water to decline and leave the harbors and river passages too shallow for the accommodation of the fleet.

This is doubtless the most serious problem that confronts the commerce of the lakes. In spite of the work done by the government in deepening the Detroit, St. Clair and St. Mary's Rivers to 20 feet, which work is now nearly finished, the decline of the levels of the lakes themselves is such that the work will prove to be practically valueless unless something is done to save the water in the lakes themselves. Buffalo harbor is as deep as any on the lakes, and still the grain fleet now arriving is scarcely able to stir unless the wind is favorable.

The decline of the level of Lake Erie from the government normal is now fully two feet and Niagara River is estimated to be 6 to 8 inches lower than it was last spring. While it is a matter of dispute whether the deepening of the passages affects the lake levels, the work is so necessary that investigation would produce no results nearly so valuable as the discovery of some means of holding the lakes themselves in place.

There is much speculation over the utility of dams at the mouth of this and other lakes, but the plan will hardly be tried till something arises to make it appear feasible. The advocates of dams have feared to ask an appropriation of Congress for the purpose of experimenting, especially when so many other improvements are wanted, but would welcome anything tending to show that dams would prove effective. It appears that the evidence is now to be had.

The first vessel left Buffalo this season on April 20. There was at the time about 80 miles of ice to pass through before reaching open water. This ice disappears mainly through the action of the sun, but during the week, or perhaps fortnight, taken for it to disappear, large masses of it become detached and pass down the river. Naturally, this ice occasionally strikes the rocks at the head of the river, as the water is shallow, where it forms an imperfect dam. For some time the vessel men in the harbor, which is on the lake level, noticed that the depth of water was subject to sudden variations. An observation of the water line on the docks would show a rise or a fall of a foot or more in an hour or so.

These changes were carefully observed now for the first time, as there was so much more dependent on the depth of water than usual at this time of year. Most of the incoming grain fleet could not be moved about the harbor unless the water was at its highest, while usually they have come and gone at any stage of the water. The water level is materially affected by the wind, but there were changes of level that took place with no corresponding change of the wind, and it was at length found that whenever the ice field escaping into the river was caught on the shoal at the head of it the water rapidly rose and the vessels aground inside could be released.

The main point of the showing seems to be the effectiveness of so frail and irregular a barrier as that formed by the ice, and, after that, the rapid rise of the water. But for the destructive force of storms and the flow of ice in spring, the showing is sufficient to prove that the dumping of ordinary stones, such as are constantly obtained from marine rock blasting, would be sufficient to solve the problem; and it is quite possible that in any case these loose stones would remain several years without any cement or anchorage to hold them, especially as in former years the silt from the harbor was dumped on the same shallows, where it remained for the most part till carried away by the ice of the following spring.

The conclusion to be reached from this action of the ice cannot be less than this: That the proposed dams need not be nearly as complete and expensive as was supposed and that they will produce the desired result.

JOHN CHAMBERLIN.

Buffalo, N. Y.

Premature Burial.

To the Editor of the SCIENTIFIC AMERICAN:

The interesting paragraph in the SCIENTIFIC AMERICAN of March 21, on "The Progress of Cremation," induces me to offer a few observations upon the above mentioned subject. In addition to the sanitary advantages which the practice of cremation possesses over other forms of the disposal of the dead, is that of the prevention of premature burial. The regulations of the British Crematorium at Woking, Manchester, and Glasgow, require that, previous to cremation, the body shall be examined by one independent medical practitioner, in addition to the doctor attending, and the examiners are obliged to certify to the fact, as well as the cause, of death. In ordinary cases a cursory and perfunctory inspection of the face of the corpse is all that is usually made, and when it is remembered how difficult it is in cases of trance, catalepsy, and suspended animation to distinguish apparent from real death, and that not a few persons (according to the evidence of those who have looked into the facts) have been buried alive, any system that will minimize this terrible risk will be welcomed by the reflective portion of every community. Alluding to the difficulty of discriminating between real and apparent death, Dr. Franz Hartmann, in his work, "Premature Burial" (the English edition of "Buried Alive," published at Boston, Mass.), observes:

"Apparent death is a state that resembles real death so closely that even the most experienced persons believe such a person to be really dead. In many cases, not even the most experienced physician, coroner, or undertaker can distinguish a case of apparent death from real death, neither by external examination nor by means of the stethoscope, nor by any of the various tests which have been proposed by this or that writer, for all those tests have proved to be fallible, and it is now useless to discuss them at length, because the medical profession has already agreed that there is no certain sign that a person is really and not apparently dead except the beginning of a certain stage of putrefaction. All other tests ought to be set down as delusive and unreliable. Mrs. Schmidt, a young woman of Kempen, died of cholera, and was put into a coffin in which she remained for seventy-two hours. Two doctors, Dr. Junker and Dr. Leon, certified to her death. At the hour appointed for her burial, her husband arrived and found the corpse of a blue black color. Believing that it would be dangerous to his life to handle the corpse, he postponed the burial to following day. On the next morning he approached the body and imagined that he found signs of life in it. He, therefore, went to the physician and informed him of it, but the doctor laughed at his credulity, telling him, however, to rub the body with vinegar. This was accordingly done, and, after an hour, the lady returned to life, and recovered entirely within a few days."

This is only one of several hundreds of authenticated cases collected by Dr. Hartmann, the details of many of which are too painful for presentation to your readers. The subject needs thorough ventilation, and the existing mode of examining the dead in America and England requires drastic reform. This may be brought about or helped forward by the attention now being directed to the public health and the public safety in respect to the establishment of crematoriums in every large center of population.

JAMES R. WILLIAMSON.

London, N. W., England.

Use of Descriptive Trade Name.

A question of much interest was decided by the English House of Lords recently in the case of Reddaway et al. vs. Banham. It appeared that the appellants had been making belting of camel hair for some time, and had stamped the words camel hair belting upon their goods, together with a camel as a trade mark. The respondent, a former employe of the appellants, made similar belting, and sold it with the words "camel hair belting" stamped upon it. In the trial court the jury found that the phrase meant among the people that bought the goods belting made by the appellants, and no one else, and that the respondent had tried to pass off his goods as those made by the appellants. A judgment in favor of the respondents was reversed by the court of appeal on the ground that the belting made by the respondent might be fairly described as camel hair belting, and that he was entitled to use these words. The House of Lords, however, reversed the decision of the court of appeal, on the ground that while, as a rule, no man can claim a monopoly in a merely descriptive title of his goods, yet if the facts show that by the use of this title a trade rival is selling goods as if they were the goods of another, a case is made out for the interference of the courts.

Science Notes.

A marble bust to the memory of the philosopher Luigi Ferri was erected on March 16 in the hall of the University of Rome.

A balloon sent up from Paris, recently, attained the height of 15,000 meters, or 9⅓ miles, before it came down near Cambrai.

X rays are to be applied to practical agriculture. Dr. Graetz, of Munich, has taken a picture of a one-day-old pig, showing its bony structure. By continuing to make pictures of the pig the action of food on its growth will be shown.

The French government has decided to continue the pension of 25,000 francs to Louis Pasteur's widow.

Doctors D'Arsonval and Charrin, of Paris, have been taking the temperature of our internal organs. They find that it is highest in the normal liver, which is one degree Centigrade hotter than the intestine; then follow in a decreasing ratio the spleen, the heart, the kidney, the marrow, the brain, the muscles, and the skin.

The National Academy of Sciences, acting on the request of the Secretary of the Interior of the United States, has reported a commission to investigate the forestry problem, consisting of Charles S. Sargeant, Alexander Agassiz, Henry L. Abbot, William H. Brener, Arnold Hague, and Gifford Pinchot. The secretary will recommend to Congress an appropriation of $25,000 to cover the expenses of the commission.

The dragon flies are the champions on fast flying. M. Marey, the French scientific photographer, found that in order to photograph one of the creatures on the wing he had to make the exposure only $\frac{1}{1000}$ part of a second.

M. Berthelot, the celebrated French chemist, has resigned from the Ministry of Foreign Affairs of France.

James Stirling says: "A valuable ally of the field geologist is to be found in the land crab. The work performed by this diminutive excavator in bringing up pieces of the rock forming the subsoil helped the miner to find coal seams in South Gippsland, just as the burrowing wombat had disclosed a stanniferous lode in the Australian Alps. From similar evidence officers of geological surveys have traced outcrops in places where the rock was masked by alluvium."

The statement is interesting as coming from Prof. William Huggins, foremost in such researches, that beyond the violet end of the spectrum there is a whole gamut of invisible rays which only reveal themselves by their effect in promoting chemical action, and similarly, beyond the other end of the visible scale, the deep red, there is a gamut of invisible or dark rays which are only perceived by their heating effects. Some idea, he says, of the importance of the "ultra red" may be gathered from the fact that it has been traced to a distance nearly ten times as long as the whole range of the visible or light-giving region of the spectrum; to learn, then, the character of these mysterious dark rays, it has been clearly necessary for science to fit itself with some new sort of eyes for seeing what ordinary eyes cannot, namely, heat rays and chemical rays, and, in respect of the latter, the photographic plate has brought out some wonderful facts, while the bolometer has been used in feeling for absorption lines in the great invisible spectrum which lies beyond the red.

Ten thousand people visited the South Kensington and Bethnal Green Museums in London on the first Sunday on which they were thrown open. Only ten attendants and thirty-four policemen had to work on Sunday.

The nomination of John J. Brice, of California, for Commissioner of Fish and Fisheries has been confirmed by the Senate.

Descartes' tercentenary will be observed by the publication of a complete edition of his works, by authority of the French government.

The new Royal Observatory at Edinburgh has been formally opened. The observatory contains a 15 inch refracting telescope and a 24 inch reflecting telescope. Among other instruments in the building is the great Dun Echt electromagnet. A clock at the observatory is connected by telegraph with Greenwich.

The steam yacht Blencathra will carry an excursion to the Arctic regions next summer, says Science. The yacht will visit Iceland, Greenland and Hudson's Bay.

The expedition of the Russian Geographical Society, equipped for the exploration of the Irkutsk region of Siberia, has started and will be absent for three years.

The idea of the numbering of the heavenly bodies, whether planets, satellites or stars of the smallest size, was formed at the Astronomical Congress in 1887, and already 180 photographs have been taken with a view to the publication of an international catalogue. Some of these photographs only contain a dozen stars, but others are crowded even to the number of 1,500. It is expected that the catalogue will enumerate about 3,000,000 stars.

RICE CULTURE IN SOUTHWESTERN LOUISIANA.

(Continued from first page.)

each some desired spot by a "near cut" across a field would soon find himself wading in water above his shoe tops. This prairie country covers a large scope of country, and, going westward, from New Orleans to the Texas line, begins at La Fayette and runs continuously beyond the Sabine River, repeatedly interrupted by forests that generally shade deep running streams.

Considering the limitless character of this prairie country, the surface of the country is scarcely marked by farm inclosures, and thus is evidenced the unlimited possibilities held out to the farmer, who must pay a large price for a few acres in other States. The sizes of the farms in this section range from fifty to two thousand acres.

The consumption of domestic and foreign rice in the United States for ten years past has been as follows:

	Domestic. Sacks.	Foreign. Sacks.
1884	400,000	333,000
1885	600,000	246,000
1886	615,000	208,000
1887	448,000	410,000
1888	465,000	491,000
1890	500,000	450,000
1891	600,000	500,000
1892	1,000,000	500,000
1893	1,000,000	500,000
1894	1,000,000	500,000

(A sack of clean rice weighs 224 pounds)

In preparing the land for use, the first thing done is to dig the necessary main and lateral ditches and levees for irrigating purposes, and then look out for an abundant supply of water at the proper time. There are three sources from which the water supply is drawn, viz, rainfall, which is always hazardous, reservoirs and flume pumping.

The rice planter with extremely limited means constructs his system of ditches, and then relies on the elements to furnish him his moisture, and in due time, if his basins fill with water, he turns it on when needed. The reservoir is an artificial basin that catches the water in the rainy season or is supplied by a pump at or near some abundant water supply, and the water is turned on at the proper time. The most expensive means of irrigating, though the most certain, is by pumping and carrying the water through "flumes" to the larger and, at a convenient time, the smaller ditches inclosing the rice lands. This latter supply of water is taken either from a bayou, river or swamp.

The planting season is in the months of March (after about the 10th), April, May, and as late as June, while harvesting begins late in August and sometimes continues to October, though not generally so late.

I am indebted to Messrs. C. C. and W. W. Duson, of Crowley, Louisiana, for the subjoined information and for some of the pictures. They say: "The commercial names of the most popular varieties now in use in the United States are the Honduras, Carolina and Japan. The Honduras rice has much the longer and broader kernel and derives its name from the fact that the seed originally came from Honduras. The Carolina rice has a smaller kernel than the Honduras and requires less water for its cultivation. The Japan variety has a shorter berry than either of the others and is also much larger in circumference, and while the straw is much finer and shorter, the yield is more prolific and brings a higher price."

In growing rice the land is prepared the same as for wheat or other small grain and the seed then sown broadcast or in drills, about one and one-fourth bushels being used to the acre. When the crop comes up it resembles nothing so much as a Dakota wheat field. After the young plant gets from six to twelve inches above the ground it is flooded with water four to twelve inches deep, and then the water remains until that part of the rice stem above the water begins to turn yellow, ready for the reaper. The water is then drawn off into the ditches, and in a few days the hot sun dries the ground and the reapers are put to work.

The following formula gives the ingredients of the Indian rice, the same that is planted in South Carolina, brought originally from Madagascar, and about the same chemically as that planted in Louisiana:

	Per cent.
Moisture	13·00
Nitrogenous matter	7·44
Starch	77·63
Fatty or oily matter	0·70
Ash	1·23
	100·00

An average yield of a good farmer is fifteen barrels or sixty bushels to the acre. The market price reaches three dollars per barrel, though sometimes the price goes below that figure, but when the cost of cultivating is so low as one dollar per barrel or fifteen dollars per acre, the profit is fair.

Rice is thrashed and winnowed as soon after harvesting as is convenient to the planter, and is then placed in sacks in the rough state, when it is called "paddy." The most improved machinery is used to separate the rice grain from the hull.

The different terms used for the processes of converting the rice in the field into a marketable article of commerce are "cutting" or "harvesting," "stacking," "thrashing and winnowing," "raying" and "hulling." At present most of the rice goes to New Orleans for the final preparation, there being several large mills in that city. There is one mill at La Fayette, and it is now working to its full capacity. Rice will keep in the rough or "paddy" state an indefinite length of time, and loses none of its nutritious or fecundating strength.

The Southern Pacific Railroad, which passes through this rice section of Louisiana, has furnished the following figures, showing that it shipped rice in the rough state in 1886 to the amount of 2,000,000 lb.; in 1887, 4,000,000 lb.; in 1888, 8,000,000 lb.; in 1889, 16,000,000 lb.; in 1890, 60,000,000 lb.; in 1891, 180 000,000 lb.; in 1892–1893, 300,000,000 lb.

The following tabulated statement of our total rice production (cleaned rice) is furnished by one of the largest dealers:

Season.	Carolina Coast. Pounds.	Louisiana. Pounds.	Total. Pounds.
1894-1895	33,020,800	76,800,000	109,820,800
1895-1896*	56,600,000	160,000,000	215,600,000

* Estimated. Crop not all in yet.

Lawns and Tennis Grounds.

In making lawns in a locality where the surface is mainly sandy and poor one often finds, either accidentally or by observing the nature of the natural tree growth, that there are patches of clay beneath the gravel or sand: and, if near at hand, this clay is just what is wanted for making the lawn, and it is quite worth the trouble and expense of carting to the lawn site and placing a layer of six or nine inches just below the surface, so that it will serve to retain moisture and the grasses to root into. If nothing is done to stiffen the surface in a sandy or heath soil, a satisfactory lawn is almost hopeless. The reverse of this light soil is the heavy clay, with just a thin layer of lighter soil on the surface. On this surface the grasses will grow rank, coarse weeds will in time oust the grasses to a great extent; the lawn will not be fit to walk on in even only showery weather, and for games—tennis, croquet, and the like—it can seldom be used. Such a surface must first of all be underdrained by ordinary field drain pipes, laid from ten to twenty feet apart, according to the excess of moisture to be drawn off. Oftentimes in such sites it is difficult to obtain a sufficient fall as an outlet to the drains, and in such cases it is folly to attempt to underdrain a large area, but for smaller plots, such as tennis courts or croquet lawns, the outfall drain can be made to empty in a dry pit, which would be sufficient. In clay districts it is often difficult to get sand or chalk to mix with the clay for the surface, and one has to fall back upon such material as burnt ballast, made by burning the clay with coal dust, or even coal ashes or wood ashes half burnt, and this last is about the best, as the charcoal so quickly absorbs superfluous moisture.

Trenching the ground deeply is the most important condition in lawn making. A foot and a half is the depth generally specified. Trenching for a lawn is a different process from trenching for tree planting or shrubberies. By proper trenching a uniform surface is obtained, which is important in a lawn; for, if there are inequalities of surface, the lawn can never be mown properly, either by machine or scythe. Therefore, if there are on the site any pits or places where trees have been growing, their places must be rammed hard before the trenching is done. Before the trenching any alteration in the grade must be made, and if the natural surface layer is disturbed thereby, this must be replaced at the time of trenching; otherwise a uniform surface of equal texture and richness will not be obtained, and the result will be a patchy surface, that is, in the poor and dry parts the grass will be thin and pale, and have an unsatisfactory appearance. The trenching for new lawns should be done in autumn and winter, and the surface allowed to lie rough till early spring, when it should be lightly forked over to make it even, and afterward evenly trodden or rolled, raking off the large stones, and then the surface is ready for either turfing or sowing, which is best done in April.

Sodding.—The old fashioned way of making a lawn was to lay sod cut from the nearest pasture, and this is done now to a great extent in country places, and that is why one seldom sees good lawns in even what are termed the best gardens. Very seldom, indeed, can perfect sod be cut from a pasture, that is, turf composed exclusively of grasses; and even when cut from sheep pasture, and apparently free from weeds, when the turf is laid on a richer soil weeds will invariably crop up in it and in time become a nuisance, only to be got rid of by persistent hand weeding, a tedious and costly process on lawns of large area. The true way of making a perfect lawn is unquestionably that of sowing pure grass seeds guaranteed to be free from seeds of weeds, and nowadays the most reputable seed houses do this, and supply mixtures to suit any soil. The mixing of the various kinds of grasses in true proportion suitable for the different kinds of soil is quite a fine art.

Sodding is a simple operation. The chief points to observe are cutting the sods of uniform thickness, and laying them immediately on the surface that has been prepared by leveling and making firm. After being sown, the turf should be well and evenly beaten, and after this it should be rolled, and then a layer of fine rich soil thrown on and brushed in so as to fill up the interstices. Seed sowing is best done in April, during fine or showery weather. It should be evenly scattered by hand on the firm and even surface, and lightly raked in, and as the sower proceeds another should scatter over the seed a layer of fine soil; but it is most important that this soil has been sterilized, and that there are no seeds of weeds in it, and therefore must not be taken from the surface anywhere, particularly from a kitchen garden.

Seeds sown in April quickly germinate, and when the sward is about two inches high it should be well rolled, and after a day or so, should be mown, first with a scythe and after that it can be mown by a lawn mower, which should not be set too low at first. Later in the season it may be cut lower, though it is a mistake to set it too low, as the grass roots are torn, and the lawn does not recover for some days, and, besides, a lawn cut too close dries up so much more rapidly. It is the practice of some to scatter artificial manure on the young grass crop, but this is not necessary if the soil has been properly prepared. Better reserve the manure until the lawn really requires it, which it will in a season or two after sowing, in order to keep it perfect. The edges of lawns by walks are generally made by turves, even if the main part is sown; but this is a mistake, as the difference between the laid turf and the sown grass will always be perceptible. The best way is to overlap the edges a few inches and sow with seed, and when the turf is thick, cut off the edge. Though April is the best time for sowing, it can be done from March till May, if not too dry, and in autumn during August and September. The quantity of seed required is about fifty pounds per acre; smaller areas will, of course, require quantities in proportion.

Tennis courts, croquet lawns, cricket pitches, or golf links require special care in making, as it is highly important that these should be in a fit condition to play upon in all weathers. They must, therefore, be made to provide against being soft and spongy during a wet season, and not dry up in a dry one, and the principles for making these are the same as for the perfect lawn. Special care should be taken in making the parts that undergo most wear in playing, which in tennis are the base lines, in cricket the wickets, and in teeing greens the centers. On all lawns where games are played it is essential the surface should be as level as practicable, and in order to effect this it is, in tennis and croquet, often necessary to cut out from a slope and fill up parts. This cutting out requires to be very carefully done, otherwise the part cut out from the solid will often be poor and dry, and the filled up part will cause the grass to grow rank; therefore even and deep trenching is necessary all over, so as to make the surface of uniform texture and quality.—Abstract from the Gardeners' Magazine.

National Electrical Exposition.

The exhibits are being rapidly installed in the Grand Central Palace, on Lexington Avenue between Forty-third and Forty-fourth Streets, New York City, where the National Electrical Exposition will open on May 4. The building is remarkably well adapted for exhibition purposes, as it measures 200 by 275 feet. The center is occupied by a main exhibition floor, and around it is built a building six stories high, and there is also a basement. Large elevators and numerous stairways give access to the different floors. The building is lighted by 4 000 incandescent lamps. The lighting plant will supply current to exhibitors either for light or power. The model of the Niagara power plant will be run with current transmitted from Niagara over Western Union wires. About forty receivers will be grouped around it, so that visitors will hear the roar of Niagara. Mr. Edison, Mr. Tesla and other celebrities of the electrical world will be present on the opening night, which promises to be a memorable occasion. One of the most interesting exhibits will be the loan collections of apparatus. The valuable Morse relics will be shown.

The department of physics and electrical engineering of Cornell University has also provided an important exhibit. The Lighthouse Board have loaned an exhibit showing how Gedney's Channel is now lighted. Mr. W. J. Hammer will show a notable collection of two hundred portraits of celebrated electricians. The great companies are nearly all represented by an adequate display.

The Patent Office exhibits 360 models of electrical apparatus. A practical working laboratory has been provided and special lectures have been arranged for.

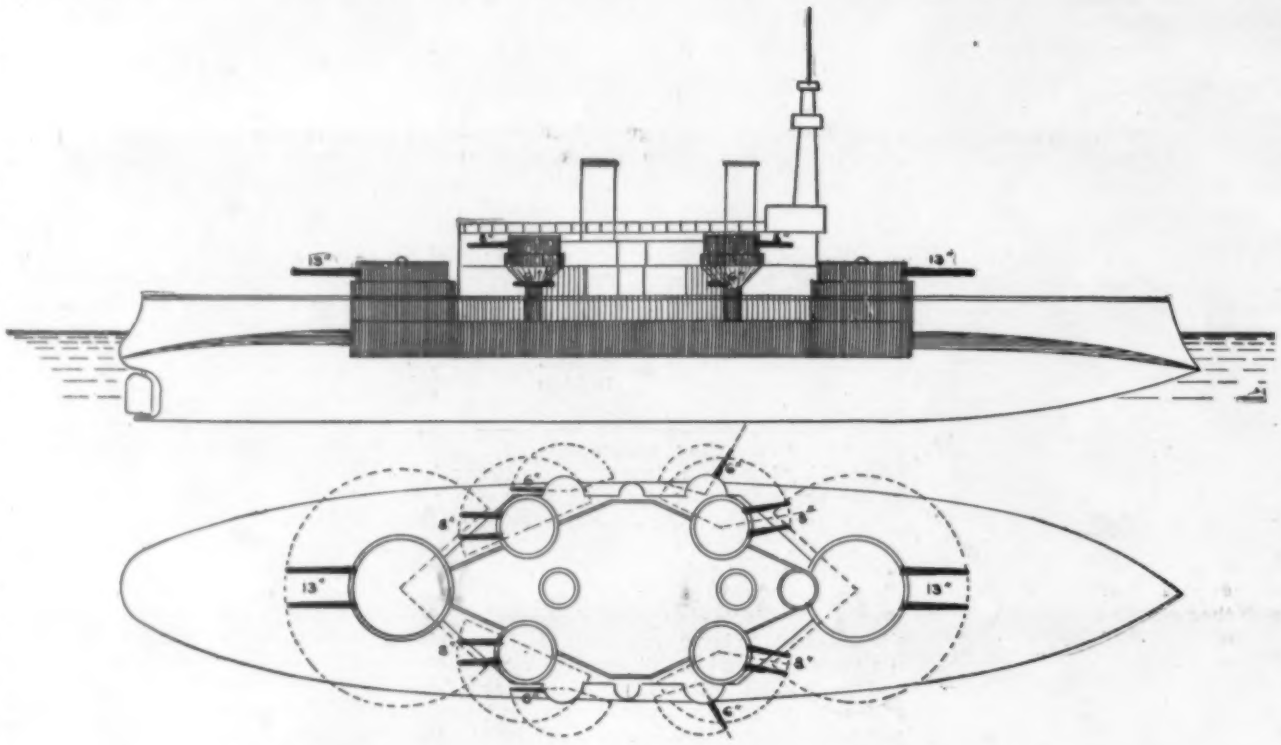
THE Swiss National Exhibition at Geneva was opened on May 1, and the Millennial Anniversary Exhibition at Budapest on May 2.

THE SPEED TRIAL OF THE UNITED STATES BATTLESHIP MASSACHUSETTS.

On Saturday, April 25, the first-class battleship Massachusetts, a sister ship to the Indiana and Oregon, underwent her full speed trial over the thirty knot course off Cape Ann. As the course was covered twice in succession, the total distance run by the ship was sixty knots, and the boilers and engines were being pushed to their fullest capacity the whole of that distance.

The engine performance during this severe trial was admirable. There were no heated journals, nor was there a leaky joint, tube or rivet in the boilers. On the first run over the course the average speed was 16·08 knots, and the second thirty-one knots was covered at average speed of 16·21 knots, making an average speed for the whole sixty knots of 16·15 knots an hour. This is 1·15 knots faster than the speed called for by the contract, according to which the builders were to receive $25,000 for every quarter of a knot above 15. She thus earns a bonus of $100,000 for her builders, the Cramps Ship Building Company, of Philadelphia. The highest speed obtained on the trial was 17·03 knots, which was maintained continuously for six miles.

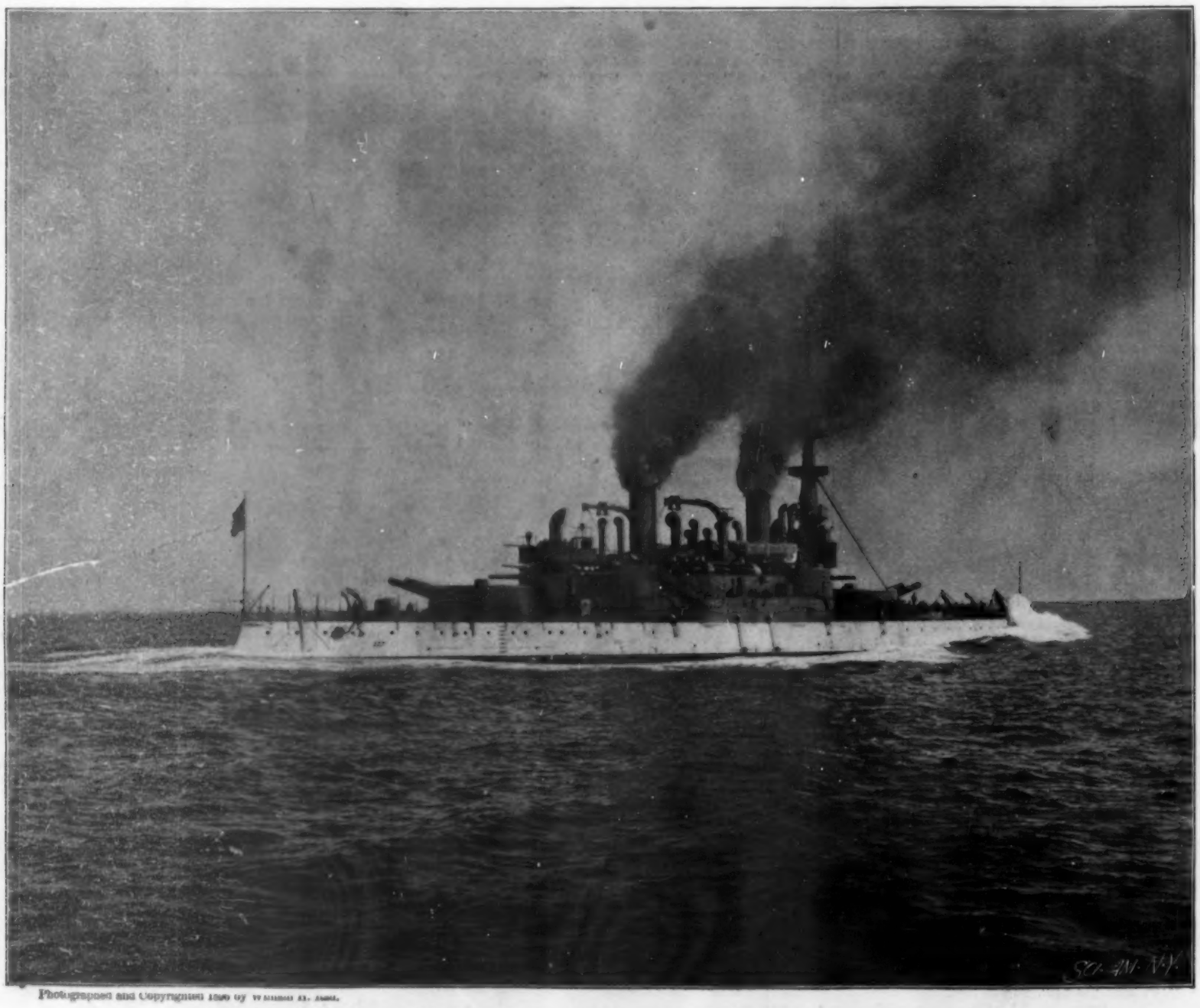
The ease with which the Massachusetts reached and maintained this high rate of speed is the more remarkable because speed was not one of the objects aimed at by her designers, her displacement being mainly devoted to guns and armor, in which she is probably the most formidable battleship afloat today. The possession of this extra knot of speed adds considerably to her fighting efficiency. Superior speed in a duel between two modern battleships will be as valuable as was the possession of the weather gage in the days of the sailing ship. The faster ship can give or decline battle; can determine the range at which the battle shall be fought, and will be better able to use or avoid the ram than her slower opponent.



BATTLESHIP MASSACHUSETTS—SIDE ELEVATION AND DECK PLAN.

Although this speed is not up to the performance of some of the later European battleships, it must be remembered that the records of 17 and 18 knots, credited to the latter, were often made over measured mile courses and at the cost of badly leaking boilers; indeed, it has been a common experience for the trial trip of a European battleship to be suddenly cut short by leaking or priming in boilers or overheating of the engines.

In view of the high average speed of the Indiana type, it has been suggested that the six new battleships should be supplied with sufficient horse power to give them at least an equal speed. The Kearsarge



Photographed and Copyrighted 1896 by Wilson A. Reed.

THE BATTLESHIP MASSACHUSETTS PHOTOGRAPHED AT HER FASTEST SPEED.

and her mate are of 1,237 tons more displacement than the Indiana, and yet, as at present designed, the horse power is to be only ten thousand, which is the amount that was indicated by the Massachusetts during her recent trial. The estimated speed corresponding to the ten thousand horse power of the Kearsarge is fifteen knots. It would be a wise policy to make the fifteen and a half to sixteen knot speed of the Indiana type the lowest allowable rate of speed for the battleships of the new navy. When a fleet goes into action, its speed will be limited to the speed of the slowest ship, and a wise policy would suggest that the new battleships should be as least as fast, if not a little faster than, their predecessors, even if this should involve the addition of another thousand horse power to their boiler capacity.

The Massachusetts and her sister ships are designed specially for coast defense, as distinct from the Iowa, which is a seagoing battleship. They sit low in the water, their freeboard being about 12 feet, and consequently they will form a more difficult target to hit than the lofty ships of some foreign navies which have a freeboard of over 20 feet.

Their sphere of action will lie off the coasts and in the harbors and roadsteads, although it should be understood that, if called to do so, they could make the transatlantic trip with ease. As they will operate within easy reach of the home ports, they do not require to carry a large supply of coal and ammunition. The weight which is ordinarily devoted to these in the seagoing ship has been devoted in the Massachusetts to guns and armor, with the result that she could deliver heavier blows and stand more hammering than any other battleship afloat.

Protection.—The "vitals," that is the engines, boilers, and magazines, are protected by a continuous vertical wall of 18 inch armor at the water line, 7½ feet high, which is roofed in by a flat steel deck 2¾ inches thick. At each end of this armored wall a circular barbette of 17 inch armor is built up to a height of 15 feet above the water line. Within this revolves a turret of 15 inch steel, in which is placed a pair of 13 inch guns. It will thus be seen that from the water line up to the guns there is a continuous wall of steel 17 and 18 inches thick to protect the turret machinery, the powder and shell, and the gun crew.

The eight 8 inch guns, which are carried at the great height of 26 feet above the water line, are similarly protected. A stout ammunition tube of 5 inch steel protects the ammunition in its passage from below the armored deck to the base of the barbettes. The barbettes are protected by 8 inches and the turrets above them with 6 inches of steel. The 6 inch guns are protected by 6 inches of steel, and shells are prevented from entering and bursting below them by a belt of 5 inch steel, which rises above the 18 inch belt armor. A conning tower situated at the base of the military mast, and protected with 10 inches of steel, will shelter the commander when he takes the ship into action.

Now, when it is remembered that the 18 inch armor is barely penetrable by the heaviest artillery under ideal conditions at the proving ground, and that the

VANITY FAIR AT OLYMPIA—SCREENING THE LADY.

6 and 8 inch armor is equally proof against the shells of the heavier class of rapid firing guns, it is safe to say that the Massachusetts could carry her guns unharmed through a long protracted naval fight.

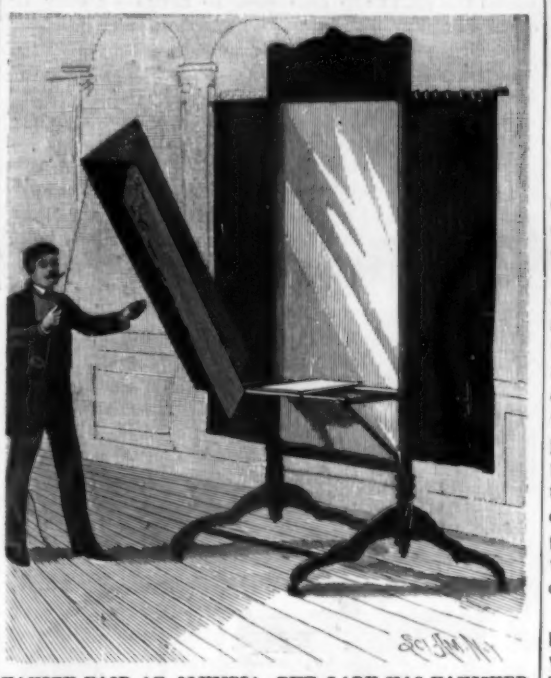
Armament.—The great offensive power of the Massachusetts is shown in the accompanying table.

No.	Caliber Inches.	Weight of shot Pounds.	Muzzle velocity Feet.	Muzzle energy Tons.	Muzzle penetration of iron Inches.
4	13	1,100	2,100	36,627	34·6
8	8	250	2,150	8,031	21·6
4	6	100	2,150	3,204	15·6
20	6-pounder rapid firing guns.				
6	1-pounder " "				
6	Torpedo tubes.				

It is the battery of 8 inch guns which gives this type of vessel its superior power of attack as compared with other ships; and in a naval duel it would probably decide the issue in its favor.

THE ILLUSION VANITY FAIR AT THE OLYMPIA.

We illustrate a very clever illusion which has recently mystified thousands of people who patronize



VANITY FAIR AT OLYMPIA—THE LADY HAS VANISHED.

the Olympia in this city. It presents the disappearance of a lady, apparently through a solid looking glass. The method used is remarkably ingenious.

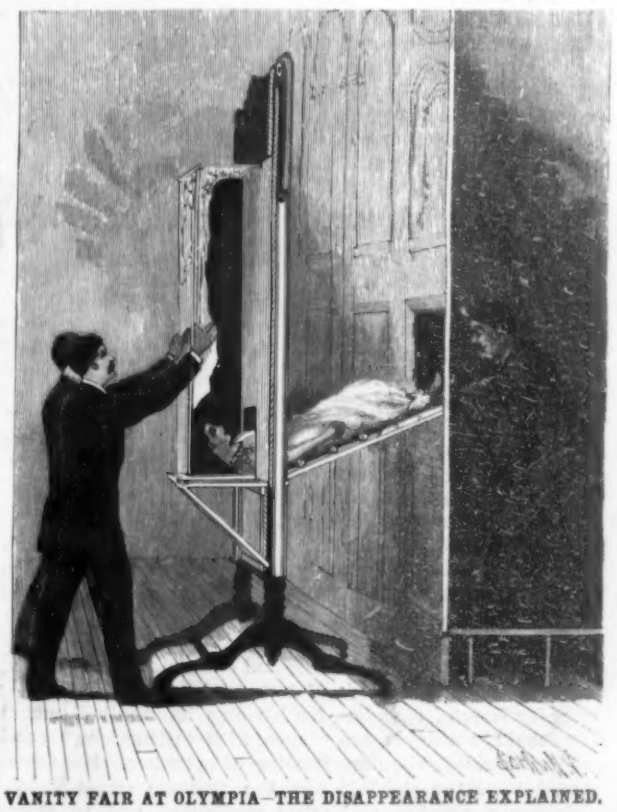
A large pier glass in an ornamental frame is wheeled upon the stage. The glass reaches down within about two feet of the floor, so that every one can see under it. The only peculiarities which a skilled observer would be apt to notice are a wide panel extending across the top of the frame and a bar crossing the glass some four feet from the floor. The first is ostensibly for artistic effect—it really is essential to the illusion. The horizontal piece purports to be used in connection with a pair of brackets to support a glass shelf on which the lady stands—it also is essential to the illusion.

Brackets are attached to the frame, one on each side, at the level of the transverse piece, and a couple of curtains are carried by curtain poles or rods extending outward from the sides of the frame. Across the ends of the brackets a rod or bar is placed and a plate of glass rests as a shelf with one end on the rod and the other on the horizontal piece, thus impressing upon the audience the utility of the crosspiece. Its real function is not revealed.

A lady steps upon the shelf, using a step ladder to reach it. She at once turns to the glass and begins inspecting her reflection. The exhibitor turns her with her face to the audience and she again turns back. This gives some byplay, and it also leaves her with her back to the audience, which is desirable for the performance of the deception. A screen is now placed around her. The screen is so narrow that a considerable portion of the mirror shows on each side of it. All is quiet for a moment, and then the screen is taken down and the lady has disappeared. The mystification is completed by the removal of the portable mirror, it being thus made evident that the performer is not hidden behind it.

Two of our cuts illustrate the performance as seen by the audience, the third explains the illusion. The mirror is really in two sections, the apparently innocent crossbar concealing the top of the lower one. The large upper section is placed just back of the lower piece, so that its lower end slides down behind it. This upper section moves up and down in the frame like a window sash, and to make this possible without the audience discerning it the wide panel across the top of the frame is provided. When the glass is pushed up, its upper portion goes back of the panel, so that its upper edge is concealed.

Out of the lower portion of the same mirror a piece is cut, leaving an opening large enough to admit of the passage of the person of the lady. The third cut, with this description, explains everything. The mirror as brought out on the stage has its large upper section in its lowest position. The notched portion lies behind the lower section, so that the notch is completely hidden from the audience. When the glass shelf is put in place, the performer steps upon it and is screened from view. The counterpoised glass is raised like a window sash, exposing the notch. The screen is just wide enough to conceal the notch, the fact that a margin of the mirror shows on each side of the screen still further masking the deception. From the scene piece back of the mirror an inclined platform is projected to the opening in the mirror. Through the opening the lady creeps and by the assistant is drawn away behind the scene; next the platform is removed, the glass is pushed down again, and, the screen being removed, there is no lady to be seen. The fact that some of the mirror was visible during the entire operation greatly increases the mystery. The lady passes through the notch feet foremost, and her position, facing the mirror, makes this the easier.



VANITY FAIR AT OLYMPIA—THE DISAPPEARANCE EXPLAINED.

Lippman's Interference Color Photography.

In a lecture before the Royal Institution, of London, on April 17, M. Lippman, as reported in Photography, stated that the essentials of his interference method of photography in colors required an emulsion almost transparent, with no visible grain, the film to be in contact during exposure with a mirror, for which a sheet of platinum could be used, but mercury was better. The rapidity of light was stated to be 186,000 miles per second, but by means of the mirror it was induced to stand still and have its portrait taken. The formation of the stagnant waves was shown by a very pretty experiment with an India rubber tube suspended from the ceiling; and the explanation that at the nodal points there was no movement of light, and consequently no reduction of silver, led up to the explanation of the deposition of the silver in strata, of which there were about five hundred in the thickness of an ordinary sheet of note paper.

The reproduction of color by these negatives was explained from the analogy of the phonograph, which was able to set up vibrations similar to those which had caused the impression on the cylinder.

MIMICRY IN PLANTS.—While, in animals, color is greatly influenced by the need of protection from their numerous enemies, plants rarely need to be concealed, and obtain protection by their hardness, their spines, their hairy covering, or their poisonous secretions. There seem to exist, however, a few cases of true protective coloring, the most remarkable being that of the stone mesembryanthemum of the Cape of Good Hope, which in form and color closely resembles the stones among which it grows: and Dr. Burchell, who first discovered it, believes that the juicy little plant thus generally escapes the notice of the cattle and wild herbivorous animals. Mr. J. P. M. Weale has also noticed that many plants growing in the stony Karoo have their tuberous roots above the soil, and these so perfectly resemble the stones among which they grow that, when not in leaf, it is almost impossible to distinguish them.

Recommendations in Regard to High Pressure Gas Cylinders.

Some time ago, after an unexplainable explosion of a gas cylinder at a suburban railway station near London, the Secretary of State appointed a committee to investigate and obtain scientific advice. The committee gave the matter careful consideration and ascertained that, of nineteen cases of explosions in different parts of the world, four were due to carelessness, one from mixed gas or vapor due to improper compressing arrangements, four to bad cylinders, three to bad cylinders or to excessive pressure due to overcharging, one due to ignition from oil, and one for which no cause can be assigned. Five were caused by explosions of pressure gages or reducing valves attached to cylinders. The report says further, which we find in the Magic Lantern Journal and Photographic Enlarger, that the committee offers the following recommendations:

A.—CYLINDERS OF COMPRESSED GAS (OXYGEN, HYDROGEN, OR COAL GAS).

(a) Lap-welded Wrought Iron.—Greatest working pressure, 120 atmospheres, or 1,000 pounds per square inch.

Stress due to working pressure not to exceed 6½ tons per square inch.

Proof pressure in hydraulic test, after annealing, 224 atmospheres, or 3,360 pounds per square inch.

Permanent stretch in hydraulic test not to exceed 10 per cent of the elastic stretch.

One cylinder in fifty to be subjected to a statical bending test, and to stand crushing nearly flat between two rounded knife edges without cracking.

(b) Lap-welded or Seamless Steel.—Greatest working pressure, 120 atmospheres, or 1,800 pounds per square inch.

Stress due to working pressure not to exceed 7½ tons per square inch in lap-welded or 8 tons per square inch in seamless cylinders.

Carbon in steel not to exceed 0·25 per cent, or iron to be less than 99 per cent.

Tenacity of steel not to be less than 26 or more than 33 tons per square inch. Ultimate elongation not less than 1·2 inches in 8 inches. Test bar to be cut from finished annealed cylinder.

Proof pressure in hydraulic test, after annealing, 224 atmospheres, or 3,360 pounds per square inch.

Permanent stretch shown by water jacket not to exceed 10 per cent of elastic stretch.

One cylinder in fifty to be subjected to a statical bending test, and to stand crushing nearly flat between rounded knife edges without cracking.

Regulations Applicable to all Cylinders.—Cylinders to be marked with a rotation number, a manufacturer's or owner's mark, an annealing mark with date, a test mark with date. The marks to be permanent and easily visible.

Testing to be repeated at least every two years, and annealing at least every four years.

A record to be kept of all tests.

Cylinders which fail in testing to be destroyed or rendered useless.

Hydrogen and coal gas cylinders to have left-handed threads for attaching connections, and to be painted red.

The compressing apparatus to have two pressure gages and an automatic arrangement for preventing overcharging. The compressing apparatus for oxygen to be wholly distinct and unconnected with the compressing apparatus for hydrogen and coal gas.

Cylinders not to be refilled until they have been emptied.

If cylinders are sent out unpacked, the valve fittings should be protected by a steel cap.

A minimum weight to be fixed for each size of cylinder in accordance with its required thickness. Cylinders of less weight to be rejected.

B.—The committee suggests that factories where gas is compressed be inspected regularly, something on the plan of boiler and elevator inspection in the United States.

Such an inspection should be directed to all matters referred to in this report as important in securing safety. The inspector should act on a scheme of instructions, which could be modified from time to time as experience showed that modification was permissible or necessary. The inspector should have the right to examine the specifications to which cylinders were manufactured, to inquire into the precautions taken to secure proper thickness and complete annealing, to examine the records of tests, and occasionally to order tests of cylinders for his own information. He should, acting in accordance with instructions, order the reannealing or retesting of cylinders. He should have the right to test the pressure gages, weighing apparatus, and other appliances, and to require alterations to be made if they were unsatisfactory. He should occasionally examine cylinders to see that they were not overfilled.

When an inspector was satisfied that the arrangements at any factory were adequate and that the precautions laid down were being taken, he should report to that effect, and a certificate should be issued stating that the factory had been inspected and that the arrangements had been found satisfactory.

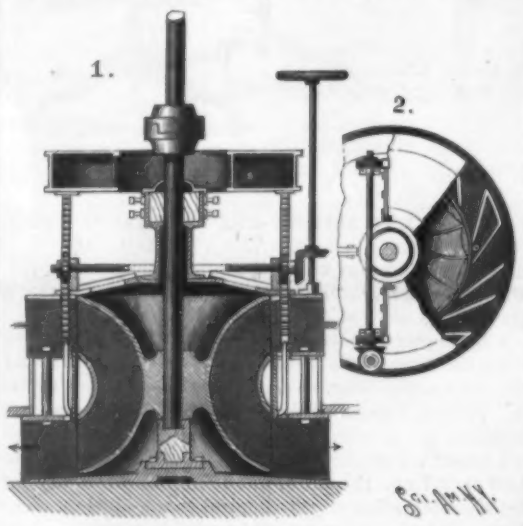
Factories holding such a certificate should be authorized to test and mark cylinders, and to place on them a special form of test mark.

C.—After such inspection and tests, the committee think that the railway companies might, without risk, withdraw the regulation as to packing cylinders, in the case of firms holding a certificate of inspection.

The high pressure system is adopted to some extent in the United States as regards other gases than oxygen and hydrogen. Explosions here of moderate pressure cylinders are very rare indeed, and we believe the express companies are not specially exacting in the transportation of such cylinders, because of their general reputation for safety.

A TURBINE WATER WHEEL.

The illustration represents a turbine water wheel of which the gates are balanced, so that they may be opened or shut with but little exertion, and made to close either the inlets or the outlets of the buckets. The improvement has been patented by Adam W. Haag, of Fleetwood, Pa. Fig. 1 represents a vertical section through the wheel and Fig. 2 is a plan view, with a portion of the top of the wheel casing broken away, showing the buckets. A central, inwardly curved belt surrounds the bucket section of the wheel, providing an inlet and outlet for each bucket, as indicated by the arrows. A series of tangential partitions is arranged in the wheel casing to form inlet buckets, and an annular gate which surrounds the wheel is secured to the lower ends of two racks, which move vertically in the casing, and whose upper ends are secured to the under face of a float. The float is preferably made of metal, and has a central opening through which the wheel shaft is carried, and is also connected by tubular rods with the space below the



HAAG'S TURBINE WATER WHEEL.

penstock, the rods serving as guides for and to deliver water from the float. Attached to the upper section of the wheel casing is a cover, in bearings on which is journaled a transverse shaft carrying pinions meshing with the racks to which the gate is secured, and the transverse shaft has at one end a bevel gear meshing with a similar gear on a vertical shaft at whose upper end is a hand wheel. The float is designed to be of suitable capacity to perfectly balance the annular gate and the connected operative mechanism. When the wheel is in operation the gate is located, as shown in Fig. 1, at the division between the outlet and the inlet, but by turning the hand wheel, the gate may be moved upward to close the inlets of the buckets, or it may be carried downward below the bottom of the penstock, to close the outlet—an arrangement designed to be especially advantageous if any obstruction should enter the inlets.

Salted Petroleum.

The Revue Industrielle, quoting from the Practische Maschinen Constructeur, describes the following process of rendering petroleum uninflammable:

If to 250 gallons of petroleum there be added 550 pounds of common salt, and the mixture be heated to 100° C., there will be collected about 60 gallons of volatile and easily inflammable hydrocarbons that are commonly called benzines. The remaining petroleum is no longer inflammable below 100° C., and, as it contains chloride of calcium, bromide of magnesium and sulphate of magnesia, its illuminating power is increased. To these 190 gallons of petroleum that have undergone distillation there are added 375 gallons of crude petroleum, and the mixture is heated for one hour at 100° C., and then allowed to cool to 40°. Then the 60 gallons of benzine that were previously separated are added, and the whole is again heated up to about 85°. The fuel thus obtained will be uninflammable below 75° C.

Notice to Our Readers.

In order to obtain the opinion of the readers of the SCIENTIFIC AMERICAN as to what invention *introduced within the last fifty years* has conferred the greatest benefit upon mankind, we publish the accompanying card, which please cut out and return to the editor. Those who preserve the paper for binding and do not desire to deface their files, or who read this notice at a library, will please answer by postal card. It is desired to get as full a vote as possible. The result of the vote will be published in the *Special 50th Anniversary Number of the* SCIENTIFIC AMERICAN *on July 25.*

Editor of the SCIENTIFIC AMERICAN.

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Why Sand Floats on Water.

In a recent number of the American Geologist Mr. Frederic W. Simonds gives some interesting observations on sand floating on water. It is quite well known that small, dry particles of substances of greater specific gravity than water will float upon it, by reason of capillary action. The surface tension of the water enabling the water to form a depression somewhat larger than the particle, this has the same result as if the specific gravity of the particle had been decreased. The phenomenon observed by Mr. Simonds at Llano River is interesting, as the granite sand was larger and heavier than the dust which had usually been observed heretofore. He tried various kinds of sand and found that they all floated, with one exception. Mr. Simonds says:

"The morning after my arrival, the river was found to be rising, and, as I stood on the bank, at the point where we secured our water supply, I noticed a considerable froth and what appeared to me at the time scum passing down the stream. I spoke of the condition of the river to my companion, Mr. Laurence D. Brooks, of Austin, who remarked that what seemed to be scum was really sand. I thereupon went down to the water's edge, and, dipping up some of the floating material, was astonished to find that the patches were composed of sand, mainly of quartz. At this time—half-past nine or ten—the water supported a large number of patches, which varied in area from less than a square inch up to several square inches, all swept along by the current. . . .

"A week later, when the river was well down and the sandy stretches of its bed had become quite dry on their surface, I gathered sand by handfuls, and sent it floating down the stream in such quantities that the sand rafts actually cast shadows on the bottom as they passed.

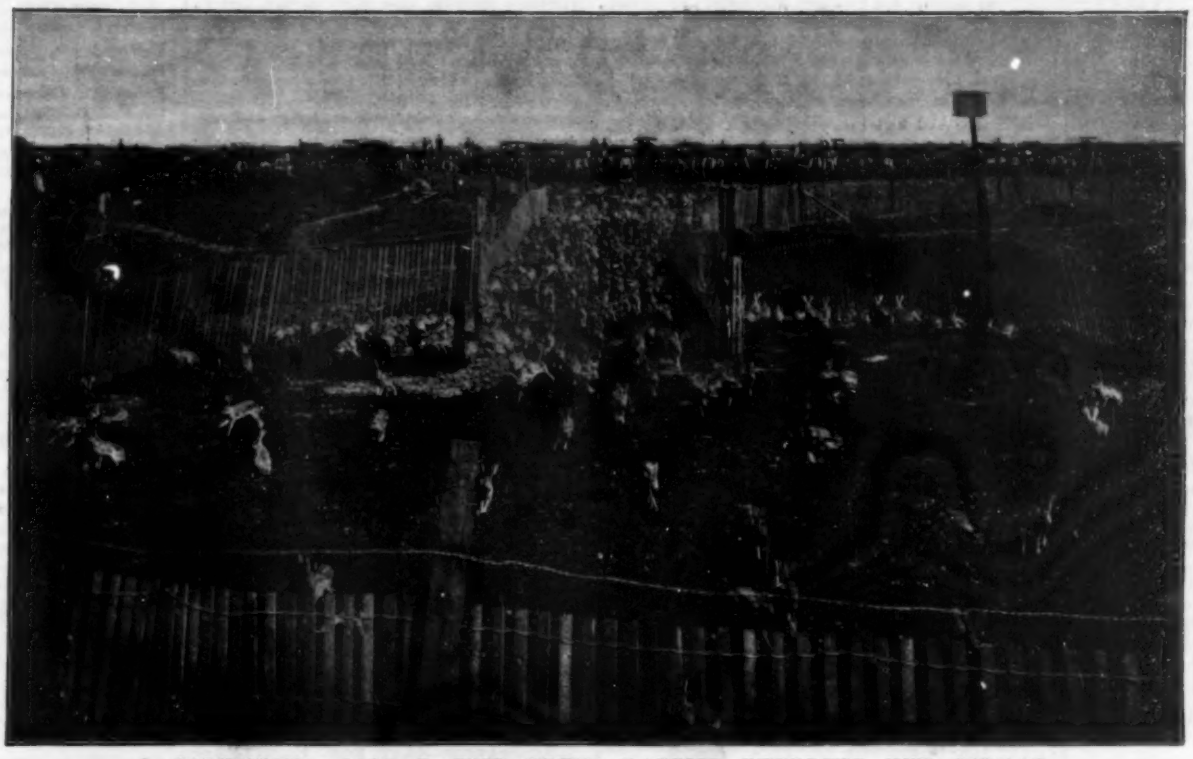
"When shaded, it will be seen that the floating sand grains cause a depression of the water's surface, which indeed is quite as apparent in the case of isolated grains as in that of patches. I recall one instance where the depression, of very short duration, possibly but a few seconds, was so great as to be positively startling. As I was sprinkling some sand upon the river, for experimental purposes, a pebble almost as large as the end of my little finger fell into the center of a floating patch, which, to my great astonishment and delight, was depressed like a funnel for say half an inch, before the cause of this unexpected phenomenon broke through the surface and sank to the bottom.

"It appears from these and other observations that the weight of the sand grains actually depresses the surface of the water; yet the elastic reaction of that surface is sufficiently great to prevent them from sinking, especially when the resistance offered by their angularity is taken into consideration. In the launching of grains the more rounded would tend to roll over in the water and thus become wet, in consequence of which they would sink, while those of an irregular shape would overcome the tendency to roll and remain partially dry, thus fulfilling a condition necessary for floating."

EXPERIMENTS have been carried on in Germany by Drs. Hall, Riegel, Notbe, and others with the view of ascertaining how the bacteria of the soil may be rendered useful. Herr Notbe has succeeded in cultivating these bacteria on a large scale, and he is convinced that the sowing of the bacteria necessary for the assimilation of nitrogen and the successful cultivation of leguminous plants will make soils more productive which need them, and will do so in a cheaper and more convenient way than the method of inoculating suitable earth, devised some years ago.

CALIFORNIA RABBIT DRIVES AND HUNTS.

This subject has recently been made the subject of a special monogram by the Department of Agriculture, to which we are indebted for the accompanying illustrations. The damage done to crops by rabbits, especially in large sections of irrigated and formerly arid lands in the West, has made necessary the taking of such extraordinary measures for their extermination. The Indians originated this method, the jack rabbits, on being started from their hiding places, usually making for the open plain, where they might be turned in their flight as desired. In the modern rabbit drives precautions are taken that no escape is left for the animals when once surrounded, and a drive always means a gala day, large numbers of people turning out with sticks and clubs and scattering over a considerable area to start the rabbits and drive them toward the mouth of the corral. The Grand Army rabbit drive, March 12, 1892, is said to have been the largest one on record. The drive took place between Oleander and Easton, twelve miles southwest of Fresno, and the conclusion of this drive forms the subject of one of our illustrations. One of the Fresno drives has been described in which nearly 2,000 horsemen took part, the hunt covering some twenty square miles.



A CALIFORNIA JACK RABBIT DRIVE—RABBITS ENTERING THE CORRAL.

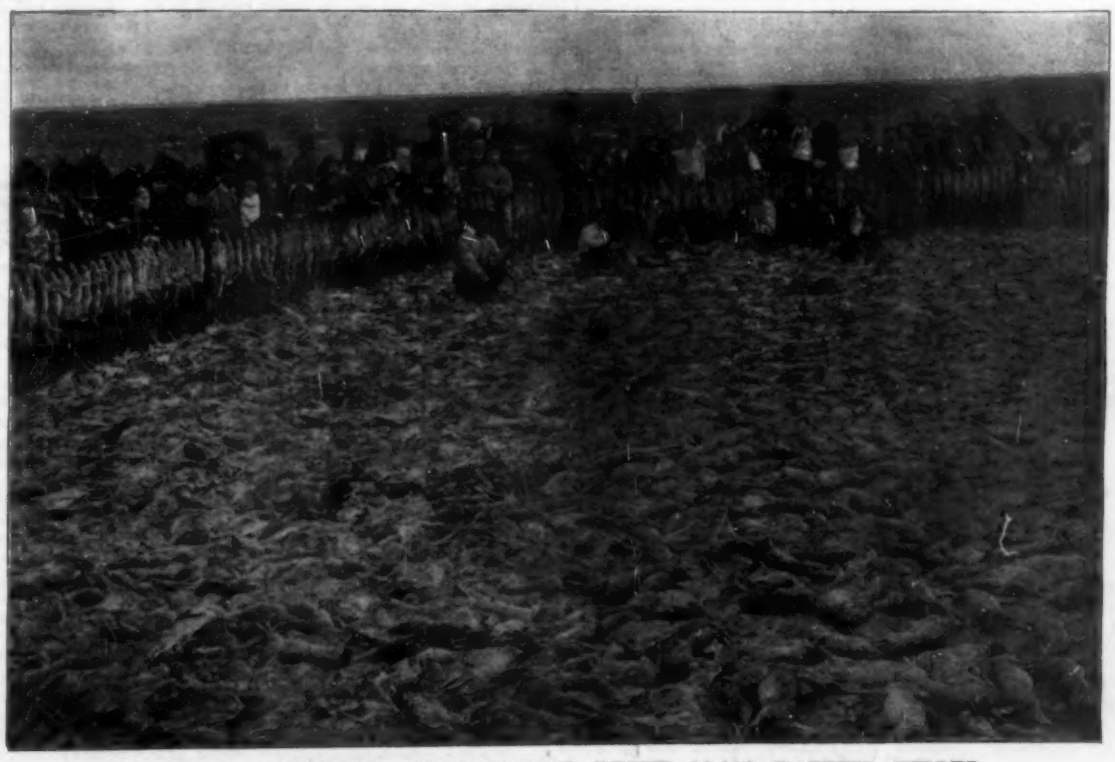
The details of the great drive near Fresno are portrayed as follows by a writer in the Chicago Tribune:

A close fence forming the corral is built about 500 yards square, with an opening or entrance for receiving the drive at one end, the opening being perhaps 50 feet wide. This is the finishing point of the drive, and will hold thousands of rabbits. From this opening diverge two fences, close enough to keep the rabbits from jumping through, about 5 feet high. These two fences diverge from the entrance for about 3 miles, increasing in their distance apart as they increase in distance from the entrance.

By 7 o'clock in the morning all is bustle and preparation for the drive. Some men have heavy sticks and some heavy clubs, but no pistols or any kind of firearms are allowed, and no dogs. The sticks and clubs are used to beat the brush and to kill the rabbits at the finish. A general is appointed to give orders, and under him are those who keep the lines in order. But sometimes they are anything but orderly. The order to start being given along the line, the cavalcade rushes forward. Boys with hoots and cries run hither and thither, wielding their sticks. Men on foot in advance lines are followed by those on horseback and in vehicles. Those on foot seem to have the best success in putting up the rabbits.

After advancing a few miles the commencement of the fences diverging from the corral can be seen. The scene is humorous at times, when a horseman is seen dashing at full speed after a jack rabbit and a man on foot running in another direction after another. Now hundreds of the poor creatures are easily discerned as the fences appear on the left and right, miles apart. Many try the back track only to meet death in the attempt. All the horsemen gallop in cowboy style, some with long sticks in their hands. Great numbers of rabbits dash in every direction in front of the advancing hosts, and far ahead the long ears of hundreds more can be seen racing for life, occasionally crouching and then starting ahead again, but still surely advancing into the inevitable death trap. The close proximity to the finish makes the chase exciting. Those on foot are heated and eager. The fence on each side is closing in fast, and although still some distance from the corral the screaming of the poor creatures can be heard as they find their retreat cut off.

The climax of the drive is now at hand. Hundreds of men and boys rush in every direction. The horsemen and carriages partly hide the view. The clouds of dust are stifling. Now the screeching of the rabbits can be heard above everything, and the ground is covered with dead rabbits by the dozen. At the corral entrance the scene is indescribably pitiful and distressing. . . . To slash and beat the poor screaming animals to death is the work of but a short time, but it brings tears to many an eye, and makes the heart sore to witness the finish. It is a relief to everybody when all is still, when the trying day is at an end.



LARGEST CALIFORNIA JACK RABBIT DRIVE—20 000 RABBITS KILLED.

THE steamer Windward, of the Jackson-Harmsworth expedition, will leave again for the Arctic Sea, early in June. The vessel will carry letters for Dr. Nansen, on the chance of falling in with him north of Franz Josef Land. More members will be sent out to recruit the Jackson-Harmsworth expedition.

British Excavations at Athens.

The British school at Athens has undertaken, besides its excavations on the island of Melos, some excavation work in Athens itself, which, so far as one can judge at this early stage, gives promise of very important results for the topography of ancient Athens. The site of the ancient Athenian suburb called Kynosarges, known chiefly for its gymnasium, was for a long time thought to lie at the foot of Mount Lykabettos, on the southeastern side. This was Leake's view, and was not disputed till recently, when Prof. Doerpfeld made it clear, from a comparison of the testimonies of ancient authors, that the Kynosarges must have lain further to the south, along the banks of the Ilissus. In pursuance of this view, Mr. Cecil Smith, director of the British school, had his attention attracted to a spot on the south bank of the river, several hundred yards below the Stadion, where the ground falls away from a small plateau in remarkably abrupt and perpendicular manner, indicating the presence of hidden walls.

As on either side of this plateau are two prominent hills, which might well be those mentioned by ancient authors in connection with the Kynosarges, it was decided to dig a trench through this plateau. The trench, at a depth of a few inches, brought to light numerous walls, chiefly of the Roman period; and one of the first constructions whose outline could be traced exactly was that of a Roman calidarium. This would seem to point to the existence of a gymnasium, and this fact, if proved, would go far toward settling the question of the Kynosarges site, provided that the remains of the classic period can be found beneath or beside these Roman remains. Numerous interesting fragments of ancient Greek vases and various metallic objects have been found in the rubbish excavated; the remains of a huge vase of Melian type, as it seems, deserve especial mention, as this would be almost a unique find in Attica. The wide extent of the ruins and the solid character of the masonry discovered thus far make it evident that this is the site of a large public building or group of buildings—a very significant fact for a spot so far outside the ancient city walls. The British school is to be congratulated on having secured a piece of work which promises to be of such importance for the study of ancient Athenian topography; and if it should prove at length to be the site of Kynosarges, it will be a source of special satisfaction to Englishmen that the site, which was eagerly sought by two English excavators at the beginning of this century, and for whose discovery Lord Byron once planned excavations, should have been brought to light by the British school at Athens.—London Times.

MM. DEHERAIA and Bemoussy have tried a series of experiments which showed the great advantage of liming strongly argillaceous soil; the lime tends to preserve the porous structure.

RECENTLY PATENTED INVENTIONS.

Engineering.

BALANCED SLIDE VALVE.—George S. Vaughn, Oil City, Pa. To thoroughly balance the slide valve and reduce the friction incident to back pressure and other causes to a minimum this inventor has devised an improvement consisting of an apertured plate having a hub sliding in the steam chest cover, and on which slides the top face of the slide valve, having an inlet bore which is at all times in register with the aperture in the plate. The improved plant is of simple and durable construction.

PRESSURE REDUCING VALVE.—Thomas P. Ford, Brooklyn, N. Y. This is an automatically working valve which may be conveniently set to the desired reduction of the initial pressure, a reducing valve chamber being connected with the steam inlet, a main valve controlling the passage from the inlet to the outlet, and there being a permanent connection between the reducing chamber and the outlet to permit the steam passing to the outlet to press on the main valve. The valve may be readily examined and repaired on simply unscrewing a bushing.

SMOKE CONSUMER.—William C. Welsh, Allegheny, Pa. According to this invention funnels are arranged in the smoke box at about the level of the bottom of the boiler, pipes on opposite sides of the boiler communicating with the funnels and passing through the fire space, while other pipes embedded in the walls of the fire box discharge into the side pipes, there being also an inlet and steam pipes arranged to create a blast through the side pipes. The improvement is designed to not only perfectly consume the smoke, but also to effect a substantial saving in fuel and better steaming efficiency.

BILGE WATER DISCHARGE.—Nicholas Power, New York City. This invention provides a siphon apparatus designed to be automatic in its action, so constructed that the valves will be opened to their full extent almost instantly when the water has reached a predetermined level in the bilge well, a steam supply pipe being connected with one end of a differential valve of the apparatus and an ejector connected with its opposite end. When the water reaches a fixed lowest mark, the valves of the device are instantly closed.

Mechanical.

SCREW CUTTING MACHINE.—Hio P. Ellers, Cleveland, Ohio. This is a triple machine, especially designed for manufacturing purposes, in which a single operator can readily handle the work for the three carriages, while the machine can be run at a speed which will insure a long life to the parts and dies and also produce perfect work in large quantities. The clutch ring heretofore employed in machines of this kind is dispensed with, and the connection between the yoke, toggle and diehead is very simple, reducing the wear of the machine at this point to a minimum.

NUT LOCK.—Jefferson D. Tynes, Fort Smith, Ark. This device consists of an open washer, one of the ends having a spur at its end and hugging the bolt, while the other end is formed with a straight portion and an arm extending upward past the first end. The device is more particularly designed for use on rail joints, but is applicable also for other purposes.

TEASELING MACHINE.—Ernst Gessner, Aue, Saxony, Germany. In machines for raising the nap on cloth, this inventor provides teaseling rollers of different diameters on one drum, united with one another to run at the same axial speed, giving different surface speeds, while the teeth of the smaller rollers point in opposite directions to the teeth of the larger rollers. The greater the difference in diameter between the large and the small rollers, the greater is the teaseling effect on the cloth, and for raising light goods it is preferred to revolve the teaseling rollers not only by the action of the cloth, but also by belts, cords or gearings.

SOLDERING IRON.—Rudolph C. Becker, Springfield, Ohio. This iron has a central hollow space with a small valve-closed passage extending to the top or point of the iron. The handle of the iron is tubular and the stem of the valve extends up it to the wooden hand piece, a spring being coiled on the stem to hold the valve to its seat, from which it may be raised by a thumb piece. The soldering liquid is held in the chamber or cavity of the head, the valve being raised to permit it to flow out, as it is liquefied by the heating of the iron in use.

Agricultural.

STRAWBERRY PLANTER.—Louis B. Scheil, San Antonio, Fla. The frame of this planter is supported by a forward planting wheel on which are three trip pins and two rear covering wheels, a plow being centrally located. A centrally pivoted arm has spring-controlled jaws to receive the plant, an extension of the arm engaging the trip device, by which the plant is taken from a holder on the rear of the frame and automatically deposited in the furrow made to receive it, immediately in advance of the covering wheels. The distance between the plants may be regulated by setting the trip pins as desired, and the planter may be used for planting seedlings or slips of any description.

HAY PRESS.—Charles A. Anderson, Cale, Indian Ter. This invention provides a rapidly working press, of strong and simple mechanism, in which the bale being formed may be tied by passing needles and wires through recesses in the plunger, forming wire bands which are twisted around the bale. A light draught horse power is also provided for the press, and a quick return of the plunger is obtained. A pivoted tucking plate above the mouth of the receiving chamber materially assists the feeding of the press.

Miscellaneous.

RADIANT HEAT BATH.—John H. Kellogg, Battle Creek, Mich. This invention provides an apparatus for use as a substitute for Turkish and Russian baths, being designed to induce perspiration at a much lower temperature and more powerfully promote the action of the skin and the elimination of carbonic acid. It consists of a cabinet whose walls are provided with mirrors reflecting light toward the center, there being incandescent electric lamps on the walls, while a sliding table carries the person into and out of the chamber. A good circulation of fresh air is maintained while the treatment is in progress.

PREPARING FLAKED CEREALS.—The same inventor has patented a process for making an improved food product, and the product itself, which is made of wheat, barley or oats, the outer husks being removed, and corn or other grains. The grain is first soaked at a temperature which prevents fermentation, then heated to cook the starch, dried, rolled between cold rollers, and the flakes baked until thoroughly dry and crisp, forming perfectly cooked food, ready to be eaten without further preparation. It will keep indefinitely, being perfectly sterilized, and is especially well adapted for sick and convalescent people.

STAGE APPARATUS.—Carl E. Nilsson, New York City. To produce an aerial ballet this inventor has devised a simple apparatus to be arranged above the stage to support the dancers and give to them the appearance of floating in the air, moving up and down and laterally. It comprises movable guide pulleys on opposite sides of a main pulley and simultaneously movable toward and from it, there being also a supporting frame with slides connected by cable, a cable mechanism for turning the pulley and suspending wires connected with the pulley and extending over the slides. The apparatus is strong and simple and not likely to get out of order.

DESULPHURIZING BLAST FURNACE SLAG.—Alexander D. Elbers, Hoboken, N. J. Slag or cinder of iron ore smelting or blast furnaces, while in ladles, is desulphurized, according to this process, in such manner that it retains sufficient fluidity to be cast into moulds, or to be granulated in water after its treatment is finished. The slag is treated with easily fusible substances that will unite with the principal impurities to form a scum, calcined sodium sulphate and fused sodium sulphate being preferably employed. The desulphurized slag may be cast into ornamental building materials or used in its granulated state for mortars, cements, etc.

HOT WATER HEATER.—John E. Wallace, Altoona, Pa. This heater has upper and lower reservoirs connected by a series of spiral pipes which surround the main combustion chamber, in which the gases and products of combustion are held for a maximum of time, and in the lower reservoir is a central space which constitutes the fire pot. The body of the heater consists of two casings, between which is an air space in which air is heated before it enters the fire, and an improved grate is provided by which the bed of fire may be shaken in a rotary direction and reciprocally.

WATER TANK VALVE.—Thomas V. Coony, Albuquerque, New Mexico. This is a valve of strong and simple construction, controlled by a float, arranged to prevent leakage and be perfectly noiseless when opening and closing. The chamber in the upper part of the valve casing is enlarged, and in operation the pressure on the upper surface of the valve exceeds that on its lower surface, quickly forcing the valve to its seat, where it is not affected by any fluttering of the water causing the float to bob.

FENCE POST.—Calvin Kutzner, Cairo, Ohio. This is a metal post made of two connected uprights of angle iron, set in a central recess of a base of burnt clay, surrounded by a filling of cement and blocks, there being a metal cap on top of the base. Notches and hooks are arranged in the uprights, with movable keys by means of which fence wires may be conveniently attached to the posts.

PLASTERING COMPOUND.—James E. Summers, Richmond, Va. Two patents have been granted this inventor for improvements in plastering compounds, one of the compounds producing a gray finish and a rough but attractive surface particularly desirable for churches and offices. It is made of crushed slag, plaster of Paris, lime, and other ingredients, in certain proportions, and is prepared in a specified manner. In the other compound hydraulic cement and vegetable fiber are also employed, the material being mixed in the room being plastered, and the compound being adapted for use on wood, wire, or metal laths, or on brick or stone, hardening in about two hours.

PHOTOGRAPHIC DARK ROOM.—John P. Brockway, Denver, Col. This invention consists of a chamber having removable sides provided with sleeves for the arms of the operator, so that he can pass his hands and arms into the chamber to manipulate the plates, films, etc., while the rest of his body is on the outside. A simple portable dark room is thus formed to facilitate the development of plates or the filling of plate and film holders.

BED SPRING.—James M. Crutcher, Atlanta, Ga. According to this invention, elastic rings are arranged in rows, and cross rods extending between adjacent rows of rings, and connected at their ends with the frame, are connected with the rings by oppositely-extending V-shaped portions. A very strong but elastic network is thus obtained, the rings assuming different shapes according to the weight or strength of the pull upon them, and assuming their original form when the tension is removed.

CUFF BUTTON.—Anton Brunka, New York City. This invention relates to link buttons, and provides a construction of the link which permits of more readily connecting and placing the buttons, rendering them also more easy of removal. One of the buttons is made with a novel socket or tube receiving a bar projecting from the other button, and in the use of the button the bar is put through one hole of a cuff and the socket through the other, the parts being then guided into engagement with each other and so held by a spring catch.

SHIRT WAIST.—Alfred Wolf, New York City. This invention provides a device for attachment to ladies' shirt waists and similar garments for supporting the waistband of the skirt at the rear, reinforcing also the gathers and preventing the waist from working up beyond the waistband. Secured to the shirt waist over the gathers is a tab or flap in which are eyelets adapted to receive hooks on opposite sides of a placket of a shirt, tapes at the ends of the tab passing around the waist of the wearer to be tied in front.

GARMENT SUPPORTER.—Richard M. Skinner, Flemingsburg, Ky. This device consists of a safety pin adapted to engage the waistband of a pair of drawers, while extending up from the shank of the pin is a hook adapted to engage the waistband of the trousers, a loop on the front portion of the hook straddling a button on the trousers.

BOTTLE STOPPER.—Henry Leidel, New York City. A "safety" stopper, to prevent the refilling of bottles once emptied, has been devised by this inventor, the invention consisting of a valve chamber at the neck of the bottle, with valve seat and inclosed valve arranged to open outward, to permit the contents of the bottle to be removed, while the valve engages its seat when the bottle is in vertical position, thus preventing liquid from being forced into the bottle from the outside. The device is simple and inexpensive, and when applied is difficult of removal without breakage.

POISON DISTRIBUTER.—George A. Brown, Hardman, Oregon. This is a device more especially designed for dropping poisoned grain for killing squirrels, and comprises a hollow, canelike rod, on which is a box containing the poisoned grain, a valve sliding in the rod on downward pressure by the operator to discharge the poisoned grain upon the ground, at the desired locations.

DISPLAY BOX.—Leopold Sonn, New York City. This is a box especially adapted for the packing and display of neckwear, the construction being such that each necktie may be mounted on an independent support removably secured in the box, thus not only displaying the neckwear to the best advantage, but preventing the soiling of the ties by handling, as in removing a tie from the box its support is to be drawn out with it. A purchased tie and its support may also be wrapped up together, preventing the rumpling of the tie in the hands or pocket of a purchaser.

HYGIENIC CHAMBER.—Amador T. Blanco, Havana, Cuba. This inventor provides a chamber for the isolation of a sick person, the air to be constantly renewed and brought to any desired temperature and humidity, and moistened or mixed with antiseptic or aromatic substances. On the top of the chamber is a series of devices through which the air is passed, including a blower, a purifier, a heater, a saturator, and a condenser, and there are gasometers for supplying oxygen to the air if desired, the invention also covering various other novel features.

ADJUSTABLE REST FOR BICYCLES.—Franz Kampf, New York City. At each side of the rear wheel an attaching plate is secured to the frame and carries a pivoted and braced rest arm, which may be swung to contact with the ground or raised therefrom and folded at each side of the wheel, by actuating shifting levers near the handle bar. The device is designed to steady the bicycle to facilitate the learning of the beginner, enables women to mount readily, may be used as a brake, and also to hold the wheel in upright position when at rest.

BODY SHIELD.—Edward Hunt, Denver, Col. To protect from the wind the throat, breast, face and ears of a bicycle rider or boatman, this inventor has devised a V-shaped shield comprised of two parts of stiff material, held to slide one upon the other, and foldable, to be used in connection with a V-shaped face shield, provided with windows and ear muffs. The shields are attached to the person by straps, and may be readily buckled to a bicycle.

AIR GUN.—John C. Raymond, New York City. This is a toy gun more especially designed to throw snow or other loose material by means of compressed air, at the same time making a noise by exploding a fulminate. The stock of the gun has an air reservoir in which is a spring-pressed piston, the barrel of the gun communicating with the reservoir by a valved port, while a port also leads to the barrel through the stock, there being likewise a plunger in the barrel and a spring between the plunger and the inner end of the barrel.

OYSTER DREDGER.—Norbert Houdreanx, Houma, La. This is a device adapted for attachment to the gunwale of an oyster boat, the dredger support extending outward and permitting the operator to stand on it and move it readily either toward the bow or the stern of the boat. The dredger may be operated by one man, the tongs being quickly raised and lowered and carried inboard and dumped.

PORTABLE ELEVATOR.—Micheal McCarthy and John H. Wehmhoff, Dalton City, Ill. This is an improvement in elevators, having transporting wheels and a platform on which loaded wagons may be driven and then hoisted at one end to dump their load into a box that slides vertically, and may be tilted to discharge its contents, as into a granary or other receptacle. The elevator has a wheeled axle pivoted at each end and may be readily hauled from place to place.

Designs.

COVERED DISH.—Robert L. Johnson, Hanley, England. The handle of the cover of this dish is of scroll pattern and twisted design, and is practically surrounded by scroll figures, while the body of the dish at its sides is divided into panels by scroll figures approaching the shape of a cornucopia, the base of the body being of scalloped decorative contour.

JUG.—Arthur S. Higgins, New York City. This jug is decorated on its surface to represent the capped and cloaked figure of George Washington, the cloak being thrown open to represent a portion of the person, the figure also holding a sword in one hand.

FAN.—Lina Barkley, Monroe, La. This is a circular fan, the outer edge of which is made up of a series of overlapped circular members, giving a scalloped edge effect, the central portion having radial divisions, outside of which are represented leaves, buds, and blossoms.

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Notes & Queries

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters or no attention will be paid thereto. This is for our information and not for publication.

References to former articles or answers should give date of paper and page or number of question.

Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all either by letter or in this department, each must take his turn.

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Minerals sent for examination should be distinctly marked or labeled.

(6843) H. P. asks: 1. What are the comparative values of (a) soft gray cast iron, (b) malleable cast iron, (c) common wrought iron, (d) Norway iron annealed, for use in field magnets and in armatures? A. Soft gray iron is probably best for field magnets of dynamos. The softest wrought iron is best for field magnets of motors. The cores of armatures should be made of the softest iron. 2. Can you give the approximate ratio of resistance which should be maintained between the windings on the field and armature of small motors for battery currents, series winding? A. For series winding give the field magnet windings two-thirds the resistance of the armature windings. 3. How would it be for shunt winding? A. For shunt winding the product of armature and field resistance should equal the square of the external resistance. 4. Has either system of winding any marked advantages over the other? If so, please state them. A. Shunt winding is advantageous for cases where the external current varies, but neither is perfect, and no absolute preference can be expressed. 5. Is not the drum armature more universally used than the ring, and what are the chief merits of each? A. The merit of the drum armature is that it is easily wound; the passing of the wire through the central opening of the ring armature makes the winding operation slow and awkward. 6. Has a motor, when running, more or less resistance than is represented by the size and length of wire used? If so, can you say, roughly, in what proportion? A. The ohmic resistance is nearly the same when running or at rest. Counter electromotive force is developed when running, which operates exactly like an ohmic resistance, and which rapidly increases with the speed. This prevents a motor from running too fast, and enables it to absorb more energy when going slow. The armature of a motor is far more liable to burn out when going slow than when going at high speed. 7. Mr. G. M. Hopkins, in describing the winding of the induction coil in his invaluable book, "Experimental Science," says wind in a lathe "set as for cutting a very fine thread," and wind "as close as possible without touching." Can you state the number of convolutions actually used in the coil referred to? No. 36 B. & S. wire is 0·005 or $\frac{1}{200}$ of an inch in diameter. Theoretically, 196 convolutions to the inch would not touch. My lathe will cut 154 to the inch. Would this be fine enough? A. The diame-

ter of the wire fixes the fineness. No. 36 wire has a diameter of 5 mils, or 200 to the inch. Allowing for space, this would give a setting of 100 to 150 "threads to the inch." Your other queries are so indefinitely put that they cannot be answered definitely. A coil once punctured is practically irreparable, except by rewinding. The current which can be used on a coil depends on the size of the primary wire. Counter E.M.F. helps to prevent too strong a current passing. You can allow, as just said, 150 turns of No. 36 wire to the inch. A foot square of tinfoil gives two square feet of surface. A coil made by an amateur giving a 2 inch spark shows good practice. Experience is very requisite in making large coils.

(6844) L. J. H. asks: 1. To what resistance should field magnets be wound to be in proportion to armature, or what resistance should armature have, to be in proportion to field? A. See answer to preceding query. 2. How much resistance in ohms has an armature wound with 1,500 feet of No. 26 wire? A. The resistance of that wire is about 61 ohms; on an armature it is one quarter this amount, because it is wound in parallel. When the armature is rotating, counter E.M.F. is generated, which produces an effect equivalent to resistance in its action on the current.

(6845) O. R. says: Can you inform me through SCIENTIFIC AMERICAN (in your Notes and Queries) in what manner I can stamp a name on to polished and crocused steel, by using rubber stamp? What acids I am to use. A. For etching brands and marks on polished steel surfaces, such as saws, knife blades, and tools, where there are many pieces to be done alike, procure a rubber stamp with the required design made so that the letters and figure that are to be bitten by the acid shall be depressed in the stamp. Have a plain border around the design, large enough to allow a little border of common putty to be laid around the edge of the stamped design to receive the acid. For ink, use resin, lard oil, turpentine and lampblack. To ¼ pound of resin put 1 teaspoonful lard oil; melt, and stir in a tablespoonful of lampblack; thoroughly mix, and add enough turpentine to make it of the consistency of printer's ink when cold. Use this on the stamp in the same manner as when stamping with ink. When the plate is stamped, place a little border of common putty around and on the edge of the stamped ground. Then pour within the border enough acid mixture to cover the figure, and let it stand a few moments, according to the depth required, then pour the acid off. Rinse the surface with clean water; take off the putty border, and clean off the ink with the turpentine. Use care not to spill the acid over the polished part of the article. For the acid, use 1 part nitric acid, 1 part hydrochloric acid, to 10 parts water by measure. If the effervescence seems too active, add more water.

(6846) J. C. W. says: We have as great an evil here in the Johnson grass as the Russian thistle in the Northwest. I saw a notice published not long since that one of the great trunk railroads was trying to destroy the weeds and grass along its track with electricity. Was this a success? If so, about what current was used and how often applied? It seems that if the smallest sprangle of root of the Johnson grass be left in the ground, it will grow and multiply faster than microbes. As yet all our efforts to destroy it seem but cultivation. If electricity will kill it in any practical method of application, about what current would be necessary? About what would the dynamo to give such a current weigh, and about what would it cost? How many revolutions per minute would be required to give such current? A. Answer by the Assistant Botanist United States Department of Agriculture: Johnson grass is propagated largely by its perennial roots, and the chief difficulty in eradicating it is in killing those roots. The roots are killed by direct exposure to frost or to the drying effect of the sun; therefore, repeated plowing during the summer drought or during open winters will effect their destruction. This method can best be applied to sandy soils. Close grazing by sheep will weaken the Johnson grass, so that it can the more easily be destroyed by cultivation. Heavy seeding with cow peas will also choke it out to a considerable extent. Small patches may be economically destroyed by the application of carbolic acid. If the Johnson grass has become well established over a considerable area of heavy clay land, and makes sufficient growth to produce good hay crops, the most economical method is to use the land as a permanent meadow, cutting one or two crops of grass each year, and top dressing and harrowing about once in two years. [We doubt the possibility of getting satisfactory results by the application of electricity.—ED.]

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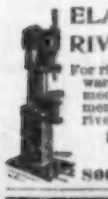

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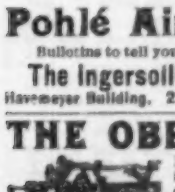

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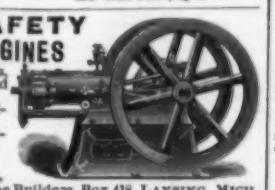

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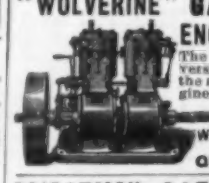

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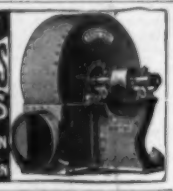

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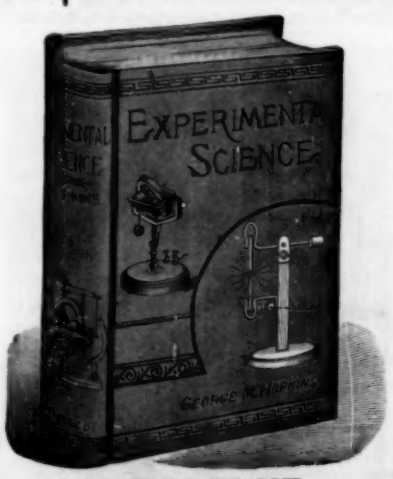

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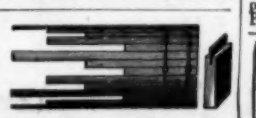

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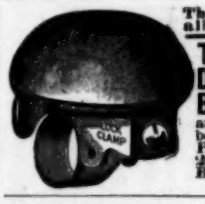

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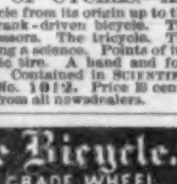

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